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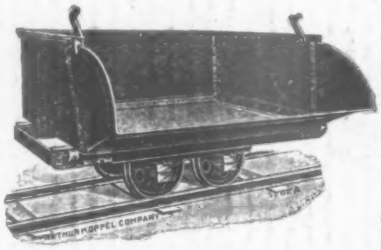

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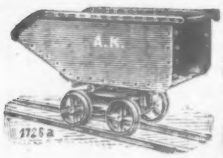

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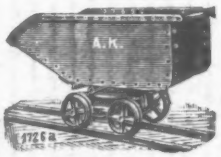

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MUNICIPAL ENGINEERING

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THE WAR WITH DUST.

By a Contractor.

In the *Revue Scientifique* (Paris, November 3), Mr. J. Crinon has a very interesting article under the title of "The War With Dust," and considers it from a sanitary point of view.

The automobile has made this war necessary and it must be fought vigorously. Numerous as are the injuries to life and limb caused by the automobile accidents, they are doubtless far less than the injuries done to the human race by the spreading of disease by the dust filling the air and constantly raised by automobiles. The injury to the roadways caused by sucking up the material composing the road and scattering it to the winds in the shape of dust, caused by automobile wheels, is merely a matter of dollars and cents, which can be replaced, but the spreading of disease is a matter of life and death and is far more serious than most of us realize. He goes on to say:

"The air of our cities contains an incalculable number of microbes. Miquel has counted 5,500 to the cubic meter in the air of the Rue de Rivoli (Paris). These microbes come from sweeping, dusting, or simply from the ventilation of particular spots. The number of microbes in free air is almost negligible in comparison with those found indoors. Miquel found 36,000 to the cubic meter in houses on the Rue Monge, 40,000 in the wards of the new Hotel Dieu (hospital), and 80,000 in those of the Pitie hospital. The figures are equally large when we study the air of barracks and schools. Hesse found 220,000 in a room in barracks.

"If we note that the number of microbes suspended in the air diminishes as we rise in the atmosphere, we can not deny that dust is their chief cause. It maintains the microbes in the air, and must be regarded as a murderous substance from which only a miracle will save us.

"As dust is principally the result of the trituration of stone and of various hard inorganic debris, it causes a huge quantity of minute abrasions on our mucous surfaces, which serve as gates to admit microbes, as breaches through which they invade the organism."

The writer goes on to show that this dust, which acts as a vehicle, preserving, distributing and scattering these bacteria, comes from the streets and roads and is a menace to health of the gravest character and shows at length that all the remedies heretofore tried have been either wholly or partially failures. The author next treats of the methods of cleaning. We read:

"Dry sweeping must be rejected as very dangerous; it displaces the dust, raises it into the air, without doing any good, to the great detriment of the neighboring dwellings and the passers by. It ought not to be permitted at all.

"Watering lays the dust, it is true, but forms mud, and this mud, when the water evaporates, becomes dust again. The watering must thus be frequently repeated. This necessitates an expense for water and labor that all towns can not meet. The city of Paris has just built an automobile water-cart that makes 9 kilometers (about 5½ miles an hour) and tramway companies use trolley water-cars. In seaside places, sea water is often used, and this has sometimes been made antiseptic by electrolysis, but the process is expensive."

He concludes that where the cost is not prohibitive the remedy is to treat the roadways with oil (asphalt oil), which not only effectually lays the dust and prevents this scourge, but preserves the surface of the roadway when properly applied and the proper material used. In this country where this proper material may be had at a price which makes its cost, even when applied, very insignificant compared with the result secured, it should be generally adopted. We have within our reach a remedy which will

change automobiling to a pleasure without endangering the health and lives of people on all roadways where they are used.

The damage to property caused by this dust blown into houses where it injures the furniture, the hangings and rugs, which would remain fresh twice as long were it not for this injury, is, of course, very great. In many localities where, prior to the application of oil to the roadways, in hot summer weather people could not have their windows open or sit on their porches, the air is now as clean and fresh as immediately after a shower, the foliage is clean instead of gray, vegetation luxurious instead of withered.

In England many cases are reported where country places located near roadways frequented by automobilists, have been sold for half their cost because the dust raised by the automobiles became unendurable. Prosperous vegetable gardens, orchards and flower gardens have been ruined and abandoned for this cause. With a remedy at hand, why continue to endure this insufferable nuisance and menace to health and property?

A prominent attorney of Evanston, Ills., writes as follows, under date of September 17:

"Yesterday, Sunday, which was a hot, pleasant, dusty day, there were thousands of automobiles on the North Shore. At about 5:30 in the evening I sat in my carriage on Sheridan Road, at the University gate, where I had a view to the north of nearly a mile, and where the line of vision on the roadway took in both that part of Sheridan Road treated with oil and that not so treated, both of which were coved with a procession of automobiles; that part treated with asphalt oil was in most excellent condition, without one particle of dust, the air clear and the sky blue, while up to the north where the oiling ceased, the automobiles and their occupants disappeared in the cloud of dust and even the color of the sky had to be guessed at.

"Now, in such a situation there is no room for argument and the only remaining questions are, how long will the treatment last and the question of cost."

A ROAD IN FAYETTE COUNTY, KENTUCKY.
Built in 1901 and treated three times with Asphaltoilene.

THE COST OF MANUFACTURING ILLUMINATING GAS.

By William D. Marks, Consulting Engineer, Philadelphia, Pa.

The following is abstracted and extracted from testimony of William D. Marks, consulting engineer and statistician, in an investigation by the circuit court of the United States for the southern district of New York. Mr. Marks has had long experience in public service companies and is well equipped by training and experience to analyze accounts and determine values. He has had special experience in electric and gas lighting companies and his conclusions are therefore particularly valuable. His testimony in the case of the Consolidated Gas Company of New York vs. the Attorney General and others is voluminous and detailed and only a few selections from it in explanation of his conclusions can here be given.

Output per Capita. The output per capita for each year is obtained by dividing the total gas sales for each year by the population of it.

It is of interest to observe this output per capita, as it forms a very important factor. In the year 1888 it appears to be 5,626 cubic feet, and then steadily rises with gas at $1.26, to the year 1893, when it reaches 6,331 cubic feet. In 1894 it appears to fall off slightly to 6,344 cubic feet, and again in 1895 falls to 6,321, rising again in 1896 to 6,370 cubic feet. In 1898 with gas at $1.15, it rises to 6,595 cubic feet, and again with the advent of the reduction of prices about May 1, 1899, it rapidly rises to 8,128 cubic feet for the year 1900.

It will be observed that the gas war, during which the Consolidated Gas Company, the New York Mutual Gas Company, and the Standard Gas Company reduced the price of gas to 65 cents and the New Amsterdam Gas Company reduced the price of gas to 50 cents, the sales per capita rose with extraordinary rapidity, although the reduced price of gas extended only from May 1, 1899, to about May 20, 1900. The average reduction in the price of gas during the two years 1899 and 1900 was 33 cents and the sales per capita increased 1,533 cubic feet. Dividing this by 33 cents, we can see in a rude way that the sales per capita increased 46.46 cubic feet (in these two years) for each 1 cent of reduction of selling price. Upon reflection it is obvious that the raising of the price of gas to $1.00 in 1900 would be likely to put a stop to the increase of the sales per capita, and it did.

The cost of manufacturing and distributing gas of 22 candle power is analyzed as follows, the data being taken from the books of the companies:

CONSOLIDATED GAS COMPANY OF NEW YORK.
SUMMARY OF OPERATIONS FOR THE CALENDAR YEAR 1905.

	Quantity	Price per unit	Amount	Quantity per M. c. f. made	Divisor 10,657,810 Cost per M. c. f. made	Divisor 10,419,461 Cost per M. c. f. sold
1. Coal—Bituminous, tons	229,282	$3.18	$729,606.21	48.19	$6.84	$7.00
2. Coal—Anthracite, tons	106,024	4.36	462,680.25	22.82	4.34	4.44
3. Coal—Boiler, tons	10,399	3.67	38,156.43	2.19	0.36	0.37
4. Cartage			18,222.89		0.17	0.18
5. Labor handling			49,150.07		0.46	0.47
6. Total			1,297,815.85		12.17	12.46
7. Residuals—						
8. Coke—Loads	167,071	2.02	338,300.91		3.17	3.25
9. Loss—Labor handling			35,678.39		0.34	0.34
10. Loss—Cartage			11,164.97		0.10	0.11
11. Net			291,457.55		2.73	2.80
12. Tar (coal) tons carbonized	229,282	28.59	65,546.70		0.62	0.63
13. Ammoniacal liquor, lbs	4,896,886	01.34	65,849.65		0.62	0.63
14. Carbon, lbs	485,720	01.00	4,857.20		0.04	0.05
15. Spent oxide, lbs	5,577,034	00.11	6,196.47		0.06	0.06
16. Oil tar, gallons	2,710,826	01.93	52,207.26		0.49	0.50

		Quantity	Price per unit	Amount	Quantity per M. c. f. made	Divisor 10,657,810 Cost per M. c. f. made	Divisor 10,419,461 Cost per M. c. f. sold
17.	Total residuals, lbs			486,114.83		4.56	4.67
18.	Net total, lbs			811,701.02		7.61	7.79
19.	Coke used, tons	19,892	3.22	62,972.09		0.60	0.61
20.	Labor			1,293.31		0.01	0.01
21.	Cartage			43.87			
22.	Total			65,309.27		0.61	0.62
23.	Naphtha, gallons	5,587	04.38	244.43			
24.	Gas oil, gallons	41,876,670	04.23	1,769,968.42	3.93	16.61	16.99
25.	Fuel oil, gallons	2,502	02.00	50.04			
26.	Lime, bushels	62,374	04.99	3,114.02		0.03	0.03
27.	Oxide, bushels	121,485	15.78	19,173.35		0.18	0.18
28.	Water, cubic feet	22,684,200	*1.00	22,684.20		0.22	0.22
29.	Fuel oil labor (including drip oil labor if used in manufacturing)			4,424.70		0.04	0.04
30.	Oil, waste and sundries			5,407.15		0.05	0.06
31.	Cartage			17,123.60		0.16	0.17
32.	Labor			382,632.04		3.59	3.67
33.	Net amount of material and labor			3,101,832.24		29.10	29.77
34.	Repairs to apparatus			169,197.39		1.59	1.62
35.	Repairs to buildings			24,900.69		0.23	0.24
36.	Repairs to tools and implements			16,228.48		0.16	0.16
37.	Expense			59,016.97		0.55	0.57
38.	Distribution			31,855.34		0.30	0.31
39.	Experiments			3,030.08		0.03	0.03
40.	Profit and loss adjustment			†7,508.39		†0.07	†0.07
41.	Distributing station expenses			56,538.57		0.53	0.54
42.	Station cost			3,455,091.37		32.42	33.17
43.	Cost of gas manufacturing under agency agreement			997,039.89		34.04	34.82
44.	Total cost at holder. Divisor—13,283,164.			4,452,131.26		32.77	33.52
45.	Expense			490,855.36			03.69
46.	Distribution			281,524.12			02.12
47.	Repairs to gas stoves			55,954.35			00.42
48.	Repairs to mains			126,110.31			00.95
49.	Repairs to services			89,033.46			00.67
50.	Repairs to meters			172,925.52			01.30
51.	Repairs to buildings			15,116.68			00.11
52.	Repairs to tools and implements			15,610.59			00.11
53.	Street lamps			289,259.09			02.18
54.	Interest on consumers' deposits			51,391.52			00.39
55.	Bad and doubtful debts			82,095.11			00.63
56.	Profit and loss adjustment			†29,683.92			†0.22
57.	Total distribution			1,641,092.19			12.35
58.	Expense—General office			339,999.51			02.56
59.	Vacations and sickness			8,175.20			00.06
60.	Automobiles			5,064.16			00.04
61.	Advertising and legal			105,800.02			00.80
62.	Real estate rents			42,674.71			00.32
63.	Gas Company's Mutual Aid Society			6,413.99			00.05
64.	Superannuation			14,943.86			00.11
65.	Insurance			54,031.83			00.41
66.	Taxes			965,843.88			07.27
67.	Contingent expenses (includes renewals)			1,328,516.37			10.00
68.	Total general expenses			2,871,263.53			21.62
69.	Fixed charges			972,423.44			07.32
70.	Total operating			9,936,910.42			74.81

*Thousand. †Credit.

71. Gas made at Consolidated Company's stations....	10,657,810,000		
72. Gas made at other company's stations under agency agreements	2,929,210,322—	13,587,020,322 c. f.	
73. Gas sold, made at Consolidated Company's stations	10,419,461,426		
74. Gas sold, made at other company's stations under agency agreements	2,863,702,341—	13,283,163,767 c. f.	
75. Excess made over sales, 2.24 per cent.....		303,856,555 c. f.	
76. Gas sales, cubic feet.....	13,283,163,767		

Item 70, Total Operating, is given as $9,936,910.42 or 74 31-100 cents per 1,000 cubic feet of gas made, distributed and sold.

The items which I eliminate because they obviously are not chargeable to the cost of gas, are as follows:

Item 47, Repairs to gas stoves.....	55,954.35	00.42 M. c. f.
Item 53, Street lamps	239,259.09	2.18 M. c. f.
Item 54, Interest on consumers' deposits.	51,391.52	00.39 M. c. f.
Item 67, Contingent expense	1,328,316.37	10.00 M. c. f.
Item 69, Fixed charges	972,423.44	07.32 M. c. f.
Total rejected items.....	2,697,344.77	20.31 M. c. f.
Balance doubtful items.....	7,239,565.65	54.50 M. c. f.
Item 70	9,936,910.42	74.81 M. c. f.

By the rejection of the above stated items, we find the total operating costs to be $7,239,565.65, and the actual cost of gas appears to be 54.50 cents per M. c. f.

An investigation made into item 66, Taxes, $965,843.88 or 7.27 per M. c. f., is as follows:

Taxes on real estate.....	$179,778.95	
Taxes on personal property...	88,839.00	
Taxes on special franchises...	406,909.23	
Taxes on mains, pipes, etc....	14.91	
Taxes on income from gas business	70,538.02	
Total.....	$746,080.11	
Taxes on income from other companies' securities	5,257.48	
Taxes on dividends in excess of 4 per cent on $38,643,590.14, stock invested in securities..	57,965.39	
Taxes on $41,356,409.86, stock in gas business.....	62,034.61	
Interest on unpaid taxes.....	94,506.29	
	219,763.77	

We observe that instead of item 66, Taxes, $965,843.88 we should have 746,080.11 or 5.61 cents per M. c. f., showing a reduction of 1.66 cents per M. c. f., which subtracted from 54.5 cents per M. c. f., gives 52.84 cents per M. c. f. for the apparent cost of gas up to this point.

For the calendar year the Real Estate Rents received, Item 62, amounted to $37,408.88, leaving a balance of $5,265.83, or about .04 cents per M. c. f., which subtracted from 00.32 cents leaves 00.28 cents. Subtracting this 00.28 cents from 52.84 cents, we have 52.56 cents for the present figures on the apparent cost of gas.

Item 67, Contingent Expenses $1,328,316.37, or 10.00 cents per M. c. f., has been omitted, and so far as possible, should have substituted for it the actual renewals. Referring to the testimony before the Gas and Electricity Commission of New York, it appears that this account was sophisticated by the introduction of a theory, and the actual renewals hidden within the 10 cents per M., arbitrarily fixed as the cost of contingencies and renewals. The total is $194,666.87, or 1.45 cents per M. If we add this sum to the apparent cost of making gas 52.56 cents, we have 54.01 cents per M.

Gas Stove rents for the calendar year were $122,322.60 and the expense thereof $55,954.35, Item 47. The difference between these is $66,368.25, or 00.50 cents. If, according to the English custom, the credit for stove rentals, or the cost of stove rentals, is entered into the cost of gas, this latter account would reduce the apparent cost of gas to 53.51 cents per M. c. f. It will be observed from this discussion of Item 47, Repairs to Gas Stoves, and Item 62, Real Estate Rents, that the apparent cost of gas is increased by putting into it the expenditures under those heads, and then adding the receipts under these heads to miscellaneous income, with the result of increasing the receipts from gas sales to over $1.00 per M. c. f., which is obviously absurd.

Mr. Marks then computes the probable net profit of operation under the probable conditions in 1907 and reaches the following conclusion:

From the foregoing it appears probable that with the price of gas fixed at 75 cents to the city and at 80 to private consumers, the net profit of operation for the year 1907 should be about $5,000,000, more or less, on an actual structural cost of something less than $30,000,000, or Complainant's Exhibit 81, Investment in Gas Business October 31, 1905, of $40,500,454.99 claimed structural cost, or of $49,110,454.99 investments claimed as required in the gas business, showing a percentage ranging all the way from above 17 in the first case to about 10 in the last case.

Mr. Marks goes into the English method of computing the cost of gas in detail and shows that it would give a cost of 53.16 cents per M. c. f. of sales as compared with his figure, given above, of 53.51 cents. He discusses allowances for insurance and reserve funds, which he rejects in common with English experts. He shows the profits at 75 cents to be 21.50 cents per M. c. f. sold or 10 3-4 per cent on necessary structural investment or at 80 cents, 13 1-4 per cent profit. This is based on an estimated cost of plant of $2 per thousand cubic feet annual capacity. A careful analysis of cost in Massachusetts companies and a careful estimate of cost in New York leads Mr. Marks to the conclusion that this estimate is slightly in excess.

Following is a summary of the results of the discussion:

Recapitulation. In 1905 the sales of gas in the Borough of Manhattan amounted to 19,540,243,000 c. f., of which the Consolidated Company sold 13,283,-164,000 c. f., or 68 per cent.

If the Consolidated Gas Company, and other companies, unreservedly accept 80 cents to private consumers and 75 cents to the city, the sales of gas in 1907 on the Island of Manhattan will amount to 22,569,846,000 c. f., of which the Consolidated Gas Company will sell about 15,340,000,000 c. f., realizing a gross revenue of $12,274,000.

From the unverified figures of Complainant's Exhibit 94, Summary of Operations for the Calendar Year 1905, it would appear as if the cash cost of gas had been about 53.5 cents and might be anything below this down to 44 cents per M. c. f. of sales, at the consumer's meter, for gas averaging 23.1 candle power.

Using English accountants' methods for computing the cost of gas, and the unverified and doubtful items of Complainants' Exhibit 94, Summary of Operations for the Calendar Year 1905, the apparent cash cost of gas made and purchased by the Consolidated Gas Company, is found to be 53.51 cents per thousand cubic feet, sold, and the total net earnings, $6,-175,342.94, as against net earnings, $4,-587,995.99 (Complainant's Exhibit 96), or a somewhat larger sum, $4,765,670, derived from the figures of Messrs. Addicks and Humphreys.

With the price of gas at 80 cents, and its cost at 53.50 per cent., the net earnings for 1907 will be $4,065,895.00, or if we take the cost of gas of 22 candle power, as found at Chicago to be 45.50 cents thousand cubic feet of sales, we would have a net earnings of $5,293,335.

The matter of a reserve fund of 5 cents per thousand cubic feet of sales, claimed by President Alexander C. Humphreys, and of 3 cents per thousand cubic feet of sales, as claimed by Vice President Walter R. Addicks, can well be eliminated, since it is clearly shown that a very large surplus accumulated by the Consolidated Gas Company from the profits of its business, has been invested in other enterprises, from which any future surplus required should be obtained.

The matter of an extra allowance for oil for increased illumination, is also shown to be necessary, since the average illumination power for the first six months of 1905 is proved to be 22 candles, and for the last six months to be 24.19 candles.

The extravagant use of oil at prices far above those obtained by many lesser companies, has added considerably to the apparent cost of 53.50 cents per thousand cubic feet of sales.

Concerning the actual structural cost of gas works, it appears that so far as the stockholders were concerned, in the consolidation of 1884, nothing was sold, and nothing was paid for in money. The only things that were done were to produce an exaggerated inventory of the cost of the works, and then to sophisticate the new books of the Consolidated Gas Company, to correspond to the fictitious capitalization effected, with the result of rendering extortion necessary to produce average dividends. It was simply a case of the old firm trading under a new name, with 2.3 times as much capitalization.

A careful comparison of the structural cost of the four gas companies operating in Massachusetts, has revealed the fact that under similar conditions to those today existing in the works of the Consolidated Gas Company, their structural cost is $1.78 per annual thousand cubic feet of sales, and the total cost of the works of the Consolidated Gas Company should be $18,546,640.58, with an allowance of $5,097,389.56 for investment in other companies, or additional structures, and an active capital of $1,626,811.32 required for the operation of the works, making a required total of $25,370,841.46.

The investigation of the accounts of the Consolidated Gas Company has not been possible in any proper sense, but the fragments accessible have been used primarily to show in instance after instance, the sophistication of nearly every account which has been presented in any form in the testimony given by the witnesses for the Consolidated Gas Company.

The manufacture and sale of gas, like many other utilities, is a natural monopoly, and competition in it would greatly inconvenience the public. Being a monopoly without competition, the profits of the gas business should be regulated by the public which it serves.

It would appear proper to limit the capitalization of the Gas Companies on the Island of Manhattan to less than $2

per annual thousand cubic feet of gas sold, and fixing the standard price of gas at 70 cents, to create a sliding scale after the manner so successfully adopted in London, which allows an increase of dividend of ¼ of 1 per cent. for each 2-cent decrease in the price per thousand, the standard rate of dividend being originally fixed at 10 per cent. and subsequently in some cases, as low as 4 per cent. (See Field's Analysis.)

The entire publicity of accounts, open to the public, is also insisted upon for English Gas Companies. In this City of New York, the regulation of quasi-public corporations, and the consideration of their needs, has not kept pace with their amazing prosperity and growth in size, and should have the immediate consideration of our governing bodies, assisted by expert analysis of the most thorough character.

PLUMBING ENGINEERING.

By Francis H. Wright, City Engineer, Helena, Ark.

The installation of efficient plumbing will require a general knowledge of civil, sanitary and structural engineering with sufficient hydraulics to enable the engineer to accurately estimate the necessary dimensions of pipes and receptacles, for the conveying of fluids under pressure and otherwise, and he should be competent to provide for the heating, lighting and ventilating of the apartments affected, if it should devolve upon him. He should have a thorough understanding of practical plumbing to attempt rational designing, and possess a sense of the beautiful as well as be something of an architect.

There is an increasing public sentiment that demands the artistic in construction, and this is especially true as regards plumbing and all sanitary works.

The plumbing engineer as well as his brothers in other ranks of the profession will find that it is well to have some acquaintance with the law, as his duties will probably call him into different States and cities, with many codes and ordinances concerning health and property, and he will have to know a good bit about contracts and the rights of tenants and patentees who may also be interested in his projects.

An acquaintance with the customs of the different building trades will assist him in the art of accurate estimating and will facilitate the speed of construction, and the correct execution of the design.

He should be up to date on the costs of materials and of patented articles, of the uses of them, and on the cost and capacities of common and skilled labor.

The rapid evolution of modern engineering makes it difficult to prophesy what duties may fall to the specialist in plumbing.

The engineering of a plumbing installation might be divided into two general classes, viz.:

(a) For an unplanned structure.

(b) For one building or built.

(a) This should be designed in conjunction with the architect, who should be freely consulted.

(1) The intended use of the building and the probable number of the occupants will govern the number and the character of the fixtures, and the probable consumption of water.

(2) The source and the quality of the water supply and the disposal of the sewage may require some investigation.

(3) The location and the allotment of space for the plumbing is an important subject.

(4) The designing should include provision for apartments with sanitary walls and floors with sufficient strength to carry imposed loads, and for ventilation, with light, heat and fire services, and protection from fire and frost.

(5) The preliminary estimate must be accurate to be of value.

(6) If the work is of some magnitude, it should no doubt be freely advertised, but for most work, it will probably be more satisfactory to have a reliable contractor take it at a stipulated price under a written guarantee, or else at cost plus a fixed sum, or sometimes at a percentage above the actual cost.

(7) Only regular bids should be considered from reliable contractors.

(8) The order of the construction, the laying out of the work, the detail plans, the inspection of the materials, of the efficiency of appliances and fixtures, of clear openings in pipes and receptacles, of careful assembling, of perfect joints and substantial supports, and adherence to plans or unavoidable deviations, but symmetrical lines and grades require the highest class of engineering supervision. Due regard must also be paid to protection of unfinished work, to exposed piping and fixtures, and to local laws and ordinances.

(9) For a large or long time job, the

contractor will need partial estimate of work from time to time on which partial payments will be made.

(10) The work should be tested and carefully examined after completion, and all defects should be at once cited and remedied, after which certificate should be issued with final estimate.

(b) This may be a building with no plumbing, or one containing some. If without plumbing, provision has perhaps been made for its installation with due regard for drainage conditions, ventilation and floor loading, but if not, the engineer will have ample opportunity to exercise his skill. If there is plumbing already contained within the structure, there will doubtless be even more ingenuity required to adapt or to change existing conditions at a minimum of expense.

Much judgment will be needed to ascertain the condition and the location of the piping concealed within the floors and the walls.

The other features will consist of the cutting out and making additions to, existing structures for accessibility, strength, etc.

Beyond this the engineering will be similar to that for a new building. Good plumbing is truly an engineering proposition.

RECENT FAILURES OF REINFORCED CONCRETE.

By Louis H. Gibson, Architect, Indianapolis, Ind.

It is with the extreme of disgust that one reads of the collapse of two notable reinforced structures. One is the Hotel Bixby at Long Beach, Cal., and the other a structure for the Kodak Company, at Rochester, N. Y. As in all cases where trouble comes to a reinforced concrete structure, the collapse of these buildings has been widely heralded. In fact, most of the material which failed was not reinforced or was not concrete in the true sense. The reinforcement was not there and the concrete, particularly that at Rochester, was a counterfeit.

In some respects there is a variation in the reports which come from the Long Beach disaster and a difference of opinion as to the cause of the collapse. The coroner's jury, which sat upon this question affirmed that the cause of the disaster was the too early removal of the forms under the roof slabs. Another investigator, who was independent, states that the cause of the failure was the design and construction of the upper tier of columns, and fault is found with the character of the concrete in the columns and particularly in the upper slabs.

The hotel disaster is not so well reported or the evidence so unanimous as referring to particular details as the report of the Rochester failure. The record as to the latter structure is of such a character as to justify an analysis and the expression of opinion. The verdict is faulty design, faulty installation, poor workmanship and — concrete. The English language fails to supply an absolute term which will characterize some of the concrete used on this building. The dash suggests lack of resource or vocabulary, but nothing worse. Furthermore, this contract was being carried forward on the "cost plus fixed sum" basis. Disgust is the only word to use to characterize the impression made by a description and record of this work.

These disasters do not discredit the general idea of reinforced concrete. They do not discredit the particular system or the kind of metal or the shape of the bars used. These happenings should in all justice have no ill effect upon the general idea of reinforced concrete or any part of the system, as such, that was employed on these buildings. These disasters will have no evil effect upon the mind of any one who carefully examines these structures or who carefully studies full and intelligent reports in regard thereto. The more carefully these structures are examined and considered as a system, the more friends will they make for the reinforced concrete idea. Careful consideration, analysis and examination of the buildings themselves will supply abundant reasons for their failure without reflecting upon the general reinforced concrete idea. Had these buildings been constructed on any other system the verdict of public opinion would not have been against the system, or the general principle or idea involved in the building, but would have been against merely the designers and builders of the structure. This is where the responsibility really belongs now and this is where in all fairness it should be placed. The builders of both these structures have done a very large amount of first-class work in the past and I have no doubt but that they will do a larger proportion of first-class work in the future. In fact, there is no reason why one should

not have as much or more faith in this corporation than ever before.

One can not say that these disasters will not result in some immediate loss to reinforced concrete buildings generally, but one may well question the ultimate loss. If they should serve to make contractors and builders more thorough, which now seems more than probable, it is reasonable to believe that the ultimate result will be beneficial to the efficient and high-minded builder. Nevertheless, the contractors for this work which has failed have cut out a large amount of unnecessary work for themselves and everybody else interested in special cement construction.

There is no occasion for going into any great amount of detail in regard to the Rochester disaster. The story is soon told. It is the official verdict that the design is faulty. It is shown that all of the metal indicated on the drawing was not installed in the work. For instance, in some cases where eight rods were shown, only four or six were used. Much that was installed was not properly installed. The concrete was shown to be generally bad and in some special cases the mixture contained sawdust, leaves, blocks of wood and other foreign material. Otherwise the concrete was improperly mixed and photographs show that it was not always well tamped and the printed reports fully confirm the impression made in the pictures.

No one will affirm that the company having physical charge of this work did not know better than to do it in this way and that this result should come about under a "cost plus a fixed sum" contract, makes the incident all the more remarkable. No one questions the ability of the contractors of this work to design a structure that would properly stand up. No one questions their capacity to properly install the metal, but here is a case where it was not done. In this particular case there was a loose screw in the organization. Otherwise, it would not have happened. The record of these failures and the history that it brings up, suggests much which may be properly considered at this time.

The spirit of promotion on the part of many engaged in the reinforced concrete business has had a baneful influence on the engineering side of the work. On this account the work has suffered. This spirit of promotion has to some extent been of a hustling, bustling, hysterical character. It has been, in a way, successful in developing business, but it has not carried with it the spirit of high seriousness and thoroughness on the engineering and constructive side of the work. Certain corporations and contractors have been top heavy on the sales side of their business and relatively indifferent to the constructive side of the undertaking. A business of this kind may be built up along engineering and constructive lines even though the sales side be measurably neglected. If the conditions be reversed we will see what we have seen and are now seeing in instances of failure which, if often repeated, will result in general discredit to the business. The value of the reinforced idea can be realized by conscientious constructive methods, but it can not be realized when the major part of the effort is directed to the sales department.

We can not create a business related to engineering construction, but we may develop it. One of the most successful companies engaged in this work has worked solely along the line of engineering, and they have specialized on this department and always sought to give to their customers the very best of engineering and construction. The world at large has heard but very little from them, but those who are led their way find them with large works in hand and evidences of a safe and profitable business. They have developed their business along engineering and structural lines and the man who runs will say that they have neglected the sales department.

The cement block business has suffered seriously from the same general qualities which now threaten the reinforced concrete worker. The makers of blocks and block machines specialized on sales and business methods to the neglect of the structural, artistic and technical features. The result was that the blocks have few friends and many enemies among architects, builders and the general public. A strong effort has been and is now being made to change the spirit of the block industry, but because of its history, it is a very difficult thing to do. There is at once bad history to live down and a new life along new lines to build up. The cement block will come into general favor only by turning around, going back and traveling the road of technical and artistic interest. How much easier it would have been to travel this road from the beginning. This easy way was pointed out and the danger note sounded by MUNICIPAL ENGINEERING, when the block idea was in its incipiency.

Architects and builders have always been friendly to cement in its various relations and especially so to reinforced concrete. The general idea of reinforced construction in itself is interesting and so fascinating, in fact, that it at once secured a sentimental as well as a practical interest. The dominant reason, however, was practical, in that the cost was

relatively low as compared with structural steel and clay fireproofing. This feature, especially, attracted capitalists to it. The Baltimore and San Francisco fires and other smaller conflagrations attracted favorable attention to concrete construction. The low structural and maintenance cost commended it especially to the builders of bridges and other engineering work. Thus, taking it all in all, no structural medium has ever come so rapidly and conspicuously into favor as reinforced concrete.

The enthusiastic general and hearty reception of this system has had a baneful effect on the character of the work done. The readiness with which the building public has taken up with the reinforced concrete idea has led many, who are tempermanently unsuited to engineering and structural work, to organize companies and to dominate the policy of certain establishments. Now, it is not every promoter who can successfully manage any business and it is certainly true that the promoter's temperament and that of the engineer do not always belong under the same roof. This question of temperament is not thought of in this connection as related broadly to the question of integrity or honor. There is, nevertheless, a difference in the quality or variety of honor required in different occupations. The honor of the engineer is different and his temperament different from those of the banker or the business man. They carry a certain large measure of pride or sentiment and at times a disregard of profit for profit's sake, which do not fit into the qualities of the notably successful business man. It is true, however, that one may succeed in business merely because he is a good engineer, and inspires the confidence of capitalists. But no one is apt to succeed as an engineer merely because he is a business man.

Now there is a definite relation between the principles above set forth and the present general situation as related to the reinforced concrete business. The writer has in mind a company recently promoted, the members of which organization had no previous experience with this kind of business. One of the stockholders has been a general contractor, another had been in the general merchandise business, yet another a retired capitalist. The general manager was a young attorney whose shingle was yet new. An inventor had come to them with what he regarded as an efficient design for steel reinforcement. On the other hand, this inventor knew nothing about the engineering side of his work. A railroad engineer was employed to make the designs and take active charge of the business. His inefficiency was soon determined, though not by those who had put money into the company, but rather by his failures, which led to his being superseded. This company had their troubles. They prepared drawings and estimates for a building and got the price too low. In executing the work for one reason or another, the proper reinforcement did not get into all the beams. Not only were certain members left out, but certain others did not reach the full length of one of the girders, and naturally there was a small collapse in one section. Other companies have been formed and are being formed on the same general basis as this one, though it may be that in the light of recent troubles investors will not be quite so ready to put up their money against engineering brains of a more or less uncertain quality.

Any one who attends conventions or reads discussions where reinforced concrete work is under discussion or one who undertakes to keep up with the literature of this kind of work, must have been impressed with the widely varying opinions on points in regard to which he might have expected an agreement. When it comes to a question of steel construction pure and simple, we find practically no great difference of opinion in essential features. Not so, however, when it comes to a discussion of metal in reinforced concrete construction. At a recent meeting in a short discussion between two systems' representatives and a college engineer who was supposed to be seeking the truth with respect to all systems and methods, a very wide divergence of opinion was expressed in regard to essential matters and in regard to which one was entitled to expect general agreement, and in default of which he had a right to question the proper understanding of the subject by at least two of those who took part in it. It is to be expected, however, that within a reasonably short time data from such sources and in such quantities will be available that there will be no occasion for this wide divergence of opinion as to essential features. If the three parties to this discussion had been witnesses in the instance of the Rochester disaster, there would have been two experts condemning existing conditions and the engineering formulae and data employed in the computations.

EDITORIAL COMMENT

The Tendencies of the National Association of Cement Users.

The Salton Sea.

THE TENDENCIES OF THE NATIONAL ASSOCIATION OF CEMENT USERS.

The recent convention of the National Association of Cement Users, held at Chicago, was in many respects quite as successful as its predecessors. The interest in the convention sessions was intense among those to whom the programs appealed and most of the sessions were well attended, notwithstanding the length of time over which they were extended, the thinning out being pronounced in its effect only on the last day.

The exhibition was by far the best which has been held. This was largely because the armory floor was the best exhibit space which the association has ever enjoyed and the exhibitors have learned that the cement users are buyers of good cement machinery. The old familiar names of former exhibitions will be found in the list with some new ones in all the lines. Concrete mixers usurped some of the space which has heretofore been devoted to block machines. The brick, shingle and tile machines also increased their representation. The cement manufacturers and supply houses were well represented.

The drawback of having the convention hall and the exhibits more than a mile apart was largely offset, so far as the exhibits were concerned, by devoting every afternoon to the exhibits, with no conflicting attraction except that of the city of Chicago in general. Undoubtedly this spreading out of the sessions of the convention affected the attendance upon them and the number of persons who did not enter the convention hall was quite large. Many times the suggestion was heard that in future the exhibits should be rigidly closed during convention sessions. This suggestion came from exhibitors who, otherwise, have no opportunity to attend the sessions of the convention, as well as from those who were interested in seeing the attendance as large as possible. Such a regulation would not have been possible at Chicago, but it can be enforced where convention and exhibit halls are close together.

Certain tendencies which the association has heretofore shown were still more apparent at the convention. Principal among these is the tendency to restrict the field of the association to the minor uses of cement, notably, to cement block and sidewalk work. Reinforced concrete received a very small amount of attention and there was a little consideration of the subject of artistic use of cement, but this was largely from the point of view or for the benefit of the workman, rather than the designer. A glance at the subjects of the papers included in the program shows the overwhelming preponderance of the block and the sidewalk with the related forms of concrete construction. This tendency is not to be decried. It was impressed upon the society before its birth by the original proposition, which was to form an association of cement block makers, and the desires of others to receive recognition and a place in the deliberations of the convention have not been expressed strongly enough to receive recognition except in the names of certain standing committees. The establishment of these committees was early official recognition of the desire for a broadening of the field of the association, but the management in preparing this program, or, possibly, in delaying its preparation until late in the year, practically dropped out of really serious consideration all but the two classes of cement construction named. The effect upon this convention was to reduce the attendance at its sessions after the first day or two by practically all the engineers and contractors interested in other lines, and the effect upon subsequent conventions will be to reduce the number of such members even below the baker's dozen, outside the official family and exhibitors, now included in the list.

It would not be possible to give the full recognition required for successful extension of the field without dividing the convention into two or more sections, holding independent sessions, and this seems to be quite impossible under the evident intention of the present management to permit no division of the responsibilities and the honors of the association. No denial can be made by any one of the entire competence of the present management to conduct a convention session successfully. The intense interest manifest-

ed by those present and the almost too strenuous elimination of erroneous statements and theories are evidence enough of the satisfaction given and the safety of its guidance. The interests which have desired representation are so diverse, however, that it is not possible to hold all the members through all the sessions, if all these interests are to receive their full recognition. Nor is it possible for one man to cover the whole field satisfactorily. Therefore, unless there is a radical change of policy in this regard, a new association for those engaged in the larger and more important uses of cement and concrete will undoubtedly be formed.

The exhibit feature was included in the first convention because it was considered to be one of the educational factors which should receive recognition and because in the absence of any organization it was the surest and most equitable way to raise funds for paying the convention expenses. It was the intention to give it a subordinate place, however. The constitution provided for single membership for firms or corporations with delegates and at the first two conventions one membership admitted the firm's delegates. The reason for accumulating a large fund has not yet developed, but the strongly expressed desire of the administration is for more money. This has resulted in putting the exhibit feature in the foreground and in drawing the lines regarding memberships so close that delegates of firms were required to pay the convention fee for delegates in addition to a full membership for the one representing the firm. The latter restriction resulted in a serious diminution of the number of full memberships, which was affected but little by the president's drastic comments upon the lack of white badges. There should be no doubt of the value of the convention sessions to those attending, especially those who are interested in block and sidewalk work, but there is a limit to the estimation of this value held by these men, and it seems to lie very near to a five-dollar membership for the firm and its delegates. Some who had come some distance chose the two-dollar memberships of necessity; some who lived near by chose to pay the exhibit single admission fees and did not join the association. The attempt to force more money out of memberships resulted in less money at this convention and is likely to have its effect upon future conventions. Whatever the true value, payment will be made according to the estimation of the value by the individual, and the average man objects to changes in fees without what he considers due notice.

The only serious complaint against the details of the convention were due to the lack of familiarity of the management with such matters. The local secretary and committees, being new, were obliged to depend upon the permanent management for information upon these matters and were not perfect in their conduct of affairs because of lack of information. An amendment to the by-laws of the association was proposed which would emphasize the necessity of as great permanence as possible in the business management of the convention, but as it was presented at the last session, when most of those affected by it were gone, the system of comparatively irresponsible business management under direction which has shown itself to be not particularly efficient in business matters was continued.

In moving the election of the list of officers presented by the nominating committee a member called attention to the undemocratic method of appointment of the nominating committee by the president and at the last session an amendment to the by-laws was presented proposing a change. But those remaining took little interest in the subject and the three or four votes actually given were against the proposed change for fear, as one speaker stated it, that "a ring might obtain possession of the association!"

THE SALTON SEA.

The engineering press has recently been full of the descriptions of the Salton Sea or sink and the attempts to keep the Colorado river out of it. This basin is some 40 by 110 miles in area and its lowest point is about 300 feet below sea level. The Colorado river formerly discharged into it but, being a silt bearing river, much like the Nile in regimen, it cut itself off from the Salton sea and has discharged for many years directly into the Gulf of California.

In 1896 a plan was made to divert water from the river to irrigate lands in and adjoining the sink and the water was actually diverted in 1901. On account of silting up of the canal, which was nearly parallel to the river for some miles, an unprotected connection was made from the river to the canal, which a subsequent flood widened and deepened. Efforts to close the break have been unsuccessful thus far, on account of the soft and treacherous nature of the silt-like soil deposited many years ago by the river.

There is an international complication, the cut-off and the break being on Mexican soil, while the irrigated lands are in the United States. There is also a busi-

ness complication, the canal being owned by an American irrigation company, but now controlled by the Southern Pacific road, control having been taken as security for loans to close the break. The railroad is vitally interested, as miles of its road are being submerged as the water rises, but seems to have reached the decision not to put any more money into the diversion work, after expending some $2,000,000 of its own funds in addition to those of the irrigation company.

All are now asking Congress to appropriate a sum of money to be expended under the Reclamation Service to close the break. The spring floods are almost here and the time is short in which to do a vast amount of work. The president's message tells a very serious story of the damage which may result from the cutting back and deepening of the channel of the Colorado river, thus lowering the water supply, actual and proposed, of hundreds of thousands of acres of land until the irrigation ditches are left high and dry.

Undoubtedly it is good policy to bend every effort to the closing of the break. All the engineering and business interests involved say so, and the strongest statements are made by government officials. There is, however, another side to the question, and it may be that if the break is not closed and the Salton sea is allowed to fill all will not be lost. Computations show that it will take some 50 years to fill the Salton sea up to sea level and that thereafter evaporation will be nearly or quite equal to the inflow. Further study may show that the irrigable lands may be reached by other canals taken from the river at other points, so that the lowering of the river bed may be only a temporary inconvenience, though leading to a considerable expenditure of money.

Possibly of far greater importance may be the effect of this sea of 1800 square miles area upon the climate of the surrounding States. If the evaporation from this great body of water should materially increase the rainfall in California, Arizona, Nevada and possibly New Mexico and Utah, it might well be said that the loss of even several hundred thousand acres of high-priced irrigated land would be but a small part of the benefit done to large parts of the areas of the great states mentioned.

The weather in Southern California is reported to have been quite different the past year from former years. Whether this was due in any measure to the presence of the comparatively small body of water now known as the Salton sea, which began to fill in 1905 and has been growing ever since, can not yet be shown. If it was, the far greater sea which the uncontrolled Colorado river will form, will have still greater and more widely extended effect. It is within the range of possibility that the millions lost through the making of the Salton sea will be replaced many times over by the sea after it is made.

THE QUESTION DEPARTMENT

CURRENT ENGINEERING LITERATURE.

Will you inform me where I can procure clippings of comparatively recent publications on the subject of sewers and waterworks?

H. D. C., Seattle, Wash.

The Engineering Magazine, New York City, has long operated a monthly index and an organization for furnishing special articles desired. The index is not very full upon municipal engineering subjects. M. C. Clark, of New York, seems to be prepared to furnish back numbers of some of the engineering periodicals.

The monthly issues of the proceedings of the American Society of Civil Engineers give references to the current articles on engineering subjects.

An excellent foreign publication of this sort is the "Revue de l'Ingenieur et Index Technique," ($2.65 a year), published monthly at 51 rue de l'Aurore, Brussels, Belgium. It gives with each article the price at which it will be furnished. Periodicals from all parts of the world are indexed in the language in which they are published. "Le Mois Scientifique et Industrial, ($5 a year), is a similar publication all in French, which gives abstracts of the articles listed.

"Technical Literature" is the title of a new periodical, the first number of

which has just appeared, which promises to do similar work for the English language. It is published in New York.

BOOKS ON CONCRETE.

Please inform me as to the best book or paper published in the interest of cement building such as hollow blocks and all concrete work. Also please state price of same. B. T. C., Higginsville, Mo.

The "Handbook for Cement Users," ($3), is one of the most useful books to the user of concrete, giving practical instruction in all classes of concrete construction and in selection of cement and other materials. MUNICIPAL ENGINEERING MAGAZINE ($2 a year), is said to contain more articles upon the various uses of cement and more practical instruction and answers to questions than any other periodical.

Other books on various uses of concrete are Rice's on "Concrete Block Construction," ($2), "Taylor and Thompson's "Concrete, Plain and Reinforced," (5), Sabin "Cement and Concrete," ($5), Potter's "Concrete, Its Use in Building," ($3).

BOOKS ON SMALL WATERWORKS CONSTRUCTION.

I am anxious to obtain your recent article entitled "A Combined Water Supply and Electric Light Plant for Small Towns," also if you can I wish you to let me know of some publication relating to the different methods of erecting waterworks plants, such as standpipes, etc. I am interested in proposed waterworks systems in the western part of Kansas and will appreciate any information in this line. G. W. S., Ellsworth, Kan.

The article referred to is probably Professor Sackett's article on "A Combined Water Supply and Electric Light Plant for Small Towns," which will be found in vol. xxx, p. 446, June, 1906. The best books on waterworks construction are Turneaure and Russell's "Public Water Supplies" ($5); Folwell's "Water Supply Engineering" ($4); Hazlehurst's "Towers and Tanks for Waterworks" ($2.50) of direct application to part of the question; and Goodell's "Waterworks for Small Cities and Towns" ($2).

THICKNESS OF CONCRETE FLOOR SLAB.

A question has arisen in connection with a contract we have let, as to whether or not the wearing surface of a floor slab applied, if possible, before the complete set of the concrete, can safely be figured as a part of the thickness of the floor slab for purposes of carrying the load, or whether the wearing surface should be treated as mortar, and the concrete part of the slab only should be figured for strength.

As an instance, for a given carrying load, where the concrete is 5 inches and the wearing surface ¾ or ⅞ of an inch, would you consider it safe to figure the floor slab 5¾ or 5⅞ inches thick, or should it be figured on the basis of 5 inches, ignoring the wearing surface?
B., H. & M. Co., Louisville, Ky.

If the floor is properly laid and the wearing surface is put on before the base has set, and is thoroughly joined to it, there is no reason why it should not be considered as a part of the thickness in estimating the strength. If the wear is excessive, so that the wearing surface is soon destroyed, allowance should be made therefor, but is not usually necessary The important thing about a reinforced concrete floor slab is the amount and location of the steel reinforcement. The concrete is usually able to carry the compressive stress coming on it if the steel is sufficient and is rightly placed to carry the tensile stress on the lower part of the slab. If the slab is not reinforced, it acts as a flat arch or dome and it would be well to add a factor of safety by not considering the wearing surface as a part of the material of which the arch is composed.

REINFORCED CONCRETE PIPE.

I have invented what I call the concrete irrigation pump. This is practically the hydraulic ram built in large sizes of concrete (reinforced). This will involve the construction of a great deal of conduit from 24 to 48 inches in diameter and in lengths which range from 100 feet to 200 feet. Also cylindrical or spherical domes for air chambers from 6 feet to 10 feet in diameter and 10 feet high. These will have to stand a pressure of from 10 pounds to 30 pounds per square inch, while the drive pipe will have to stand even more, say to 50 pounds in some cases. I have failed thus far to find anything bearing directly on this kind of construction. I want to know more about joints and how to use them. How long to leave the concrete before removing the forms, etc. I would like to know also, about joints. Will it be necessary to work continuously night and day until each section of work is complete or will the concrete run in soft enough to bond if I leave off at night and continue the next day? What pressure would be safe for a 30-inch concrete pipe, 6 inches thick, without reinforcement?
L. V., ——, Minn.

The only definite information regarding the strength of reinforced concrete water pipes is to be found in "Water Supply and Irrigation, Paper No. 143," issued by the U. S. Geological Survey, Washington, D. C. It recommends methods of construction and restrictions of use. One paragraph says:

"Do not use steel-concrete pipes for heads over 70 feet, except for short distances, where a 100-foot head might be used by taking special precautions. It may be asked why, in view of the fact that a head of 70 feet is likely to crack a 5-foot steel-concrete pipe, it is recommended to build pipes of such diameter for use under such a head. It may be

answered that a steel concrete pipe with a crack and a small, gradually decreasing leakage may be, and probably is, much more durable than a pipe made of steel or of wood with steel bands or rods, and the leakage, under ordinary circumstances, may not be as much as is now found in many lines of cast-iron pipes in our large cities."

The report is given in large part in MUNICIPAL ENGINEERING, vol. xxix, p. 353.

Whether the concrete pipes would stand the water hammer of the hydraulic ram is quite a different question and one concerning which there are no data. Also there are no data regarding the construction of reinforced concrete air chambers. It is very difficult to make concrete water tight and it will be much more difficult to make it air tight.

The "Handbook for Cement Users," ($3), Taylor and Thompson's "Concrete, Plain and Reinforced," $(5), Sabin's "Cement and Concrete," ($5), give instructions regarding handling of concrete. Good bond between work finished the night before and new work is difficult to make.

It is is not safe to use plain concrete for pipes under pressure, for the slightest crack takes away all the strength of the section in which it appears.

REINFORCED CONCRETE TOWER AND FLOORS.

Will you let me know what thickness of walls I should have for a monolithic cement structure 35 feet high, 14 by 16 feet in the clear, to carry on top cement water tank to hold twenty thousand (20,000) gallons water, the tank to be included in the height of 35 feet? There will be two cement floors between the tank and ground; the foundation is 5 feet in the ground, resting on tough red clay, the clay underlaid with gravel and earth and that underlaid with granite about 20 feet below the surface. Roof of building will be cement. The building is really an addition to old brick residence 80 years old, walls 14 inches thick. There will be three walls of cement, the other side being supplied by the brick wall until the tank is reached, the south wall of the tank resting on top of the brick wall. Opening into the cement addition there will be a door from residence on each of the two floors, arched, being immediately under the south wall of the cement tank. The two floors will be of reinforced cement, span 16 feet. What thickness of floor would you recommend? (both floors will be bath rooms), and what method of reinforcing? Would plenty of railroad rails do for the reinforcing, crossed with ⅝-inch round rods?

My plan for using reinforcement in floors was to use railroad rails, say about 6 inches apart, connecting the ends with iron rods run through them at the ends, the ends of the rails and the rods being, of course, bedded in the walls; for the cross round iron rods, my plan was to use them 4 inches apart with the ends turned down 3 inches, and hooked over a 3 by ½ inch flat bar bedded edgeways in the walls. These rods would have to enter the brick wall on the south side, which would necessitate cutting into the brick wall sufficient to enter the hooked ends of the rods and the 3 by ½ inch bar, and then fill in with rich mixture of cement and sand say one to two.

C. E. J., ——, Va.

A circular tank of reinforced concrete would be stronger than a rectangular tank of the same thickness and reinforcement. However, the dimensions and reinforcement given in the answer to a similar question in MUNICIPAL ENGINEERING, vol. xxxi, p. 277, should be very nearly sufficient. The thickness of concrete may be taken as 8 inches, the horizontal reinforcement may be ½-inch rods spaced from 3 inches apart at the bottom to 12 inches at the top and the vertical reinforcement may be ½-inch rods 2 feet apart. To insure stiffness buttresses about 4 inches thick should be put on the outside of the tank at the quarter points on each side, one of the railroad rails being imbedded in each of the buttresses. The horizontal reinforcing rods should be securely tied to these rails. The specifications given on p. 277, which are taken from "Concrete Construction About the Home and on the Farm," may be followed. The supporting walls may be made 12 inches thick.

The reinforcement described in the question will give large excess of strength if used for the bottom of the tank, the concrete slab probably being made nearly or quite 8 inches thick to allow the placing of all the reinforcement named.

The floors of the bath rooms below need not be so strong. According to the tables in "Corrugated Bars for Reinforced Concrete" these floor slabs, 14 by 16 feet, will be amply strong if made 4½ inches thick and reinforced with ½-inch corrugated bars spaced 5 inches apart. The slab should be carried mainly by the two new concrete walls, the strength of the old brick wall when pierced by the two openings proposed being somewhat problematical.

Consultation with an engineer who can become familiar with the local conditions or correspondence with manufacturers of reinforcing material would result in some saving, as the construction can doubtless be made much lighter with safety under the conditions indicated. Reference may be made to the "Business Directory" printed in each number of MUNICIPAL ENGINEERING under the headings "Civil Engineers," "Expanded Metal Construction," "Fireproof Construction," "Reinforced Concrete Construction." The booklet on concrete construction is issued by the Atlas Portland Cement Company, New York City, and that on corrugated bars by the Expanded Metal and Corrugated Bar Company, St. Louis, Mo., and

can be obtained for the asking. The Clinton Wire Cloth Company, Clinton, Mass., also issues a valuable handbook on reinforcing concrete.

ESTABLISHING A CONCRETE BLOCK BUSINESS.

I have some correspondence with the manufacturer of a staggered air spaced block, and he claims that his is the only block that can be depended on to turn moisture and frost; are there none of the other styles that are moisture and frost proof? Would you recommend any particular make?

All of the manufacturers claim theirs is the only machine worth having and it quite gets a proposed purchaser confused to find out what is the right machine or if there is any good in any of them.

I have a large supply of sand near at hand, which will be replenished as fast as removed by freshets in the river which yields the material. If this supply should not be sufficient, there is a still larger supply 3½ miles up the river from me, which I could get here handily by boat, owning one already that will carry 20 tons. There is a railroad building through here which will give me convenient north, south, east and west connections. I am located 77 miles from Richmond, the same from Lynchburg, 40 miles from Charlottesville, 25 miles from Gordonsville and about 160 miles from Washington. I have plenty of buildings I could use for the purpose of making blocks, bricks, etc. Under these conditions and with labor at about $1.00 per day, with cement at about $2.00 per barrel delivered, would you regard it as a favorable location for such a plant? What would be a reasonable price to pay for sand in the bank if it should become necessary for me to go outside of my own supply?

J., ——, Va.

Many attempts have been made to make walls waterproof without making good blocks and with varying degrees of success. The degree of success depends even more upon the maker and the layer of the blocks than it does upon the system or the machine. Good blocks can be made only by making them dense. They can be made dense by filling the voids. In order to fill the voids it is necessary to have the aggregates, sand, gravel, stone dust and broken stone so graded as to size as to make the voids a minimum; to use enough cement to insure that the voids remaining are completely filled; to use enough water to complete the chemical action of setting; and to tamp sufficiently to force all the air out and crowd the particles in the mass close together. Block makers fail in one or more of these requirements and they have been trying to offset their failures by using waterproofing, by using double rows of hollows, in pairs or staggered, by using two piece blocks, etc., when the real solution of the difficulties met with is to be found in the making of a good block in the first place.

Difficulties of the same nature are found in laying blocks, and walls otherwise waterproof leak through the joints. Undoubtedly two pieces, double rows of hollows, waterproofing, aid in the solution of the problem and they may be used to advantage, but only as auxiliaries to good materials and enough cement well put together and cured.

The vast number of machines, about four patents being granted each week, is largely due to the mistaken idea that the failures in making blocks are due to the machine. The fact is that good blocks may be made on any machine or in a wooden mold if the corners are square, the faces are parallel and the sides of the mold are rigid. There are differences in speed, some of them at the expense of good workmanship, and some because handling is made easier, and the selection of a machine must be made on the grounds stated and then on personal preference after ample trial.

Good blocks will cost more than brick, laid in the wall, unless the brick must be shipped long distances. Competition heretofore has been on the basis of cost, the blocks being made cheap enough to undersell brick, but this kind of competition has been a failure because the quality has been still lower than the price. The competition of the future must be on the basis of quality and if you see a desire for better building materials in your district, even at a little increase in cost, you will be justified in starting a block plant. The project will probably be a failure if based on anything but good materials and good workmanship, well directed, so that the product will be good enough to use without the complete dependence on the aids above mentioned which most block makers are obliged to place.

CONCRETE DAM CONSTRUCTION.

We are figuring on constructing a concrete dam and would like some information which we have not been able to get from your handbook. Dam is to be 120 feet long and 12 feet high on a solid stone foundation. Water pressure on dam is not very strong. What thickness will be required at base and top? Would it be advisable to put a timber face on spillway? Will Portland cement concrete set in still water on a solid stone foundation?

S. C. C., Manitowoc, Wis.

Lists of articles on this subject and of books treating it will be found in MUNICIPAL ENGINEERING, vol. xxxi, p. 400. It would not be advisable to begin the construction of such a dam without plans made by a competent engineer who has made a detailed survey of the site, so that he knows exactly what the local conditions demand. Reference may be made to the "Business Directory" printed in each number of MUNICIPAL ENGINEERING under the headings "Civil Engineers" and "Consulting Engineers" for names of

competent men, some of whom make a specialty of this class of work.

TREATMENT OF POOR SURFACE OF CONCRETE FLOOR.

We have been informed that you can inform us at to what is best to use on a concrete floor which was improperly laid, and is wearing off very rapidly under footwear. If you could put us on the track of what is best to lay on such a floor, we would thank you very much.
A. W. M. Co., Corinth, Miss.

This is a problem for an expert cement worker. The common method is to chip off the surface so as to give an opportunity for at least a half-inch of new top layer, leaving the surface of the old work rough. It must then be thoroughly cleaned of all particles of concrete and dust, by thorough brushing and thorough washing with clean water. Be sure that the old surface is thoroughly wet when the new surface is put on, so that a good bond may be secured. Many cement workers paint the old surface with a very wet mixture of neat cement and water to make the bond closer. The new top surface should be made of one part best Portland cement to one or one and one-half parts of sand, mixed wet and floated or troweled to finish the surface. Joints should be made to correspond exactly with the joints in the old floor. While this description may make the process seem simple, there is likely to be a failure unless the cement worker who does the laying is expert in this kind of work. The present floor may be wearing off because it was not supplied with water after laying so that the cement dried out before it had an opportunity to set. Prevent this by keeping the floor wet by wet sand or frequently sprinkling for several days after the floor is laid.

CONCRETE PAVEMENTS.

Has cement-concrete, same as used for brick-pavement foundations, been tried alone without the brick? In what towns? What has been the success with it as a road or paving material? What references can you give on the subject?
L. C. H., Bellingham, Wash.

Natural hydraulic cement is ordinarily used for brick pavement foundations or quite lean Portland cement concrete, neither of which would be durable under ordinary vehicle traffic. If it has been tried in this form the results have not been satisfactory enough to reach the technical press.

Concrete pavements with a top wearing surface of first-class concrete have been used in Bellefontaine, O., since 1890, and in Grand Rapids, Mich., Toronto, Ont., Richmond, Ind. and New Orleans, La., and elsewhere for greater or less periods of time with fair success. These pavements have all been described in MUNICIPAL ENGINEERING, vol. xvii, p. 383; vol. xix, p. 427; vol. xxiii, p. 400; vol. xxvii, p. 350; vol. xxviii, p. 386, etc. The The "Handbook for Cement Users" ($3), gives details of these and other and specifications.

WATERPROOFING FOR CONCRETE.

Carbonkote is called to the editor's attention as an addition to the water proofing compounds for use with Portland cement concrete, a partial list of which was given in vol. xxxi, p. 402.

WHERE TO GET THACHER BARS.

We are desirous of securing, for experimental purposes, some of the Thacher patent bars used in reinforcing concrete. I do not know where to send for them.
A. W. C., Terre Haute, Ind.

The Concrete Steel Engineering Co., Park Row Building, New York City, can supply the Thacher bars or refer to the nearest source of supply.

REINFORCED CONCRETE — STEAM CURING FOR BLOCKS.

Con you recommend a good work on reinforced concrete construction? One which is not too technical; something on the order of the Cement Handbook, but dealing principally with the reinforcing of concrete?

Also please give me information about the Directory for Cement Users, to which you refer. What does it embrace and what information does it contain?

Should the steel used in reinforced construction be oiled or dry. I have heard both methods advocated. Surely one or the other method is correct and not both.

Can you refer me to any one who has a complete steam drying room in connection with a plant? I am about to build one and wish to get the benefit of others' experience. D. E., Arlington, Ind.

Probably Taylor and Thompson's "Concrete, Plain and Reinforced" ($5), will most nearly meet the needs of our correspondent. Buel and Hill's "Reinforced Concrete," ($5), contains descriptions of the methods of design and construction of many existing structures.

The "Directory of American Cement Industries," ($5), contains lists of the cement manufacturing companies with their officers, agents, etc., and much information about materials, processes and products. It also has lists of the brands of cement on the market, sales agents, dealers, contractors, artificial stone makers, engineers, architects, testing laboratories, makers of and dealers in machinery for cement makers and users, etc. It is the only complete representative of the cement trades.

The steel in reinforced concrete construction should be as dry and clean as possible. Some engineers think that a little rust does not interfere, but may even

increase the cohesion of cement and steel, but rust enough to form scales would probably be dangerous.

There are numerous plants using exhaust steam for curing blocks. The National Concrete Block Co., Milwaukee, Wis., and A. A. Pauly, Youngstown, O., are two which are in mind at the moment of writing.

EFFECT OF FREEZING UPON CONCRETE.

I should like to hear from other readers of your publication as to their experience with frozen Portland cement concrete.

Up to a short time ago it had been my belief, upheld by the opinion of other engineers, that where concrete is exposed to freezing and thawing several times before it has completely set it will be badly damaged if not completely ruined, especially in thin layers such as foundations for paving.

In paving one of our important business streets this season it was necessary to place a thin layer of concrete on top of the one already in place in order to bring the surface of the new asphalt pavement up to the same grade as that of the old brick pavement which was torn up. This layer averaged three inches in thickness but varied from one to five inches in thickness on account of the unevenness of the old foundation. The new concrete was composed of one part Portland cement, three parts sand and seven parts crushed limestone.

The work was not started until late in the season and freezing weather caught us before the concrete was laid. Some of the concrete was laid while the thermometer was below freezing and froze almost as soon as laid, but most of it had from three to twenty-four hours in which to set at a temperature of a few degrees above freezing before it was frozen. The whole piece of concreting extended over a period of ten to twelve days, during which the temperature generally stood above freezing in the day time and below at night, going as low as twenty degrees above one or two nights.

After the concrete was done we let it lay for several weeks unprotected in any way and in that time the thermometer stood above freezing sometimes several days at a time and below freezing several days at a time, varying sufficiently so that the concrete was frozen throughout and thawed throughout two or three times. At one time it lay under several inches of snow for several days and immediately afterward was soaked with a rain lasting about twenty-four hours. In fact, it was subjected to almost every change of weather possible.

At various times after the concrete had been laid a few days I had samples about a foot square cut out and placed in water at a temperature of about 60 degrees. On thawing out, all of the samples were soft and crumbled easily, those that had been taken from the concrete last laid showing evidence of almost no set. However, at the end of a week in the water all specimens had hardened very greatly and now at the end of several weeks in the air at the same temperature are as hard as the average piece of concrete mixed in the same proportions.

Samples taken just before laying the binder course showed more strength at the time of removal and increased to apparently the same degree of hardness as those removed earlier.

GEO. D. DOBSON, City Engineer,
Des Moines, Iowa.

It is hoped that this letter will bring responses with statements of the experience of others. It is generally believed that freezing does not injure Portland cement concrete if it takes place after the cement has had time to take its initial set, or if the concrete is thawed out and the cement then has an opportunity to set. Alternate freezings and thawings are supposed to disintegrate the concrete, when they do, by the mechanical action of the crystals of ice formed by the freezing of the uncombined water. The question in this case seems to be as to the action of the frozen concrete after it is covered by the asphalt wearing surface. Possibly some of our readers have had experience which will throw light on this point.

CONCRETE TANKS FOR HOT LIQUIDS.

Can you furnish us with any data on reinforced concrete tanks being used for manufacturing purposes where the range of temperature varies from freezing to 212 degrees Fahrenheit.

We have work of the above nature in contemplation and if it is feasible a great deal of construction on these lines will be done in this part of the country. The tanks or tubs are to be used in distilleries.

Another question arises as to the possible tainting of the mash by the cement.

C. C. C. CO., Louisville, Ky.

If proper provision is made for expansion so that the concrete will not crack on account of being restricted in its motions with changes in temperature, there is no reason why it should not stand the temperatures named, after it has thoroughly set. There are soluble alkalies in the concrete which make the first water stored in a cement tank quite hard. Until these soluble matters have been removed it is possible that the mash would be slightly affected, hardly more, however, than from the use of hard water in it. Possibly some of our readers have had experience which they will be willing to share.

SAND-LIME BRICK.

Will you please give me the formula for making sand-lime brick if you are in a position to do so. And are sand-lime bricks a standard article, that is, will they stand the weather and carry weight as well as a clay brick?

J. A. K., Plymouth, Wis.

Sand-lime bricks are a standard building material, but there are many different manufacturers and quite a number of methods of manufacture, some of which produce good bricks and other bricks that are not so good, and one must therefore, as in the case of clay

bricks, determine what quality of brick is needed and what quality the trade will require, as well as the prices at which they can be sold and at which they can be manufactured. The amount of lime to be used depends upon the kind and quality of the lime and the sand. Not more then 10 per cent. is used and often the amount is very much less than 10 per cent., even as low as 2 to 4 per cent. There is some information about the principles of the manufacture of sand-lime brick in the "Handbook for Cement Users," ($3), and there is also information on the subject in the back numbers of MUNICIPAL ENGINEERING. The manufacture of sand-lime brick is described in the January number, vol. xxxii, p. 4; also in vol. xxiv, pp. 218 and 457; vol. xxv, pp. 37, 240, 249 and 454. Results of tests of strength are given in vol. xxvi, p. 426, xxiv, p. 218, xxv, p. 244, xxvii, p. 341. The variations in these tests are between 2,097 and 7,745 pounds per square inch, showing the wide range, due largely to conditions of manufacture.

ORDINANCE GOVERNING HOUSE CONNECTIONS TO SEWERS.

We are constructing a new system of sewers and would like to have suggestions as to a form of ordinance to govern the making of house connections.

M. R., ————————, Ind.

Following is one form of ordinance which can probably be made to suit the local conditions by some slight changes, if it is not exactly right as it stands:

Connection—Permit—Penalty. 1. *Be it ordained by the Common Council of the City of* ————, That no connection shall be made with any public sewer or drain without the written permission of the Committee on Sewers and the Sewerage Engineer of the city; and any connection or opening made into any public sewer or drain, without such permission, or in any manner different from the mode herein prescribed for such opening or connection, shall subject the person or persons making the same, and the owners of the premises directing it, to a penalty of not exceeding one hundred dollars, on conviction before the Police Judge for each offense; and each day that any person shall, without such permission, continue to use the drain into such sewer, shall be considered a separate offense.

Tapping—Fee—Permit. 2. The Committee on Sewers and the City Clerk are hereby authorized to grant such permits as they may deem proper, for allowing persons to tap the public sewers and to make connection therewith; for which such persons shall pay before the issue of such permit, to the City Treasurer, the sum of one dollar. Provided, however, That the fee for tapping any public sewer constructed wholly at public expense shall be five dollars; and Provided Further, That such permit shall be granted only on the express condition that the owner or tenant for whose benefit such connection is made, and each succeeding owner or tenant, shall, in consideration of the privileges thereby granted and enjoyed, hold the City of ———— harmless from any loss or damage that may, in any way, result from or be occasioned by such tap or connection.

Who May Tap. 3. The connection with, and openings in, any sewer or drain, may be made by any person authorized and approved by the Committee on Sewers and the City Sewerage Engineer, and none other.

Application—Bond. 4. No person shall be authorized by the Committee on Sewers and the City Sewerage Engineer to do the work of making connection with any of the public sewers or drains, or their lateral connections until he has furnished such committee and such engineer, who shall sit as a board to hear and determine all such matters, with a satisfactory certificate, signed by at least two reputable masons, if he be a mason, or by two reputable plumbers, if he be a plumber, to the effect that the applicant is known to them as a person qualified for the duties which he undertakes; and previous to being authorized or licensed by said board the party applying shall file a bond, in the office of the City Clerk, in such sum as may be designated by such committee and such engineer, not less, however, than one thousand dollars, with two or more sureties to be approved by such committee and engineer, conditioned that he will indemnify and save harmless the City of ————————from all loss or damage that may be occasioned in any wise by accident, whether from back water or other cause, or the want of care or skill on his part, in the prosecution of such work, or that may be occasioned by reason of any opening by him made in any street or alley, in the making of any connection with any public or private sewer as aforesaid, and conditioned, also, that he will promptly, at the proper time, replace and restore the street over such opening to as good state and condition as he found it previous to opening the same, and that he will conform, in all respects, to the rules and regulations which may be, from time to time, established by the Common Council and such committee and engineer, in relation to the putting in of junctions and tapping any of the public sewers and drains.

Penalty—Record of License. 5. It shall be unlawful for any person

authorized by the Committee on Sewers and City Sewerage Engineer to make connections with sewers and drains, to allow his name to be used for the purpose of obtaining such permits, or of doing any work under his authority, and any one violating the provisions of this section shall, upon conviction before the Police Judge be fined in any sum not exceeding one hundred dollars for each offense. It shall be the duty of each and every person authorized or licensed in accordance with section four of this ordinance to record his name and that of the firm in case of partnership, together with the place of business, in a book of record to be kept by the City Clerk, and also to immediately notify the board, and also immediately notify the Clerk, of any changes of either thereafter, by recording the name, firm and place of business as theretofore in said record.

Drain Pipes. 6. It shall be unlawful for any person in possession of premises into which a pipe or other connection with the public sewers and drains has been laid, for the purpose of carrying off animal refuse from water-closets, slops from kitchens or for other purposes, to allow the same to remain without good and perfect fixtures so attached as to allow a sufficiency of water to be applied as properly to carry off such matter and keep the same unobstructed. Each day the same are permitted to remain without such fixtures for supplying said water shall be deemed a distinct and separate offense. Any person violating any of the provisions of this ordinance, shall, upon conviction before the Police Judge, be fined not exceeding one hundred dollars for each and every offense.

Offal and Garbage. 7. No butcher's offal, or garbage, dead animals, or obstructions of any kind whatever shall be placed, thrown, or deposited in any receiving basin or sewer. Any person so offending, or causing any such obstructions or substance to be placed so as to be carried into such sewer or basin, upon conviction before the Police Judge, shall be fined in any sum not exceeding one hundred dollars for each and every offense. Any person injuring, breaking, or removing any portion of any receiving basin, covering plate, manhole cover, or any part of any sewer or the appurtenances, or obstructing the mouth of any sewer or drain, on conviction, before the Police Judge, shall be fined in any sum not exceeding one hundred dollars for each and every offense.

Notice of Tapping. 8. After a permit has been issued, notice in writing must, in all cases, be left at the office of the City Civil Engineer, by the person who is about to make the connection with any sewer or drain, stating the time when such work will be ready for inspection, previous to making such connection. This notice must be left between the hours of 9 a. m. and 4 p. m. on the day previous to making such connection. No drain from any house, store, or tenement whatever, shall be connected with any public sewer in this city, otherwise than by a drain pipe, which shall be six inches in diameter, excepting it may, in a special case, be otherwise ordered by the unanimous vote of the Common Council.

Repairing Work—Acceptance. 9. Each person making connections with the sewers and drains shall keep in repair and good order the whole of the work executed by him, until the same is accepted by the City Sewerage Engineer; which acceptance shall be given in writing and shall not be given until the expiration of one year after the completion of the work.

Application in Writing. 10. All applications for permits must be made in writing, by the party employed to do the work; must be accompanied by the signature of the owner and tenants (or his or their authorized agent or attorney) of the premises for whose benefit the application is made; must state the location, name of the owner, number of buildings to be connected, and how occupied; and must be made between the hours of 9 a. m. and 4 p. m. at the office of the City Sewerage Engineer.

Penalty. 11. Any person authorized or licensed to make connections with sewers and drains who shall be guilty of any violation of the provisions of this ordinance, shall be fined in any sum not exceeding fifty dollars.

Rules for Tapping. 12. The Committee on Sewers of the Common Council are authorized to make such rules and regulations, not inconsistent with this ordinance, for the tapping of the public sewers and drains, and to amend the same from time to time, as in their judgment may be deemed necessary.

Permit to Drain in Sewer. 13. No person shall drain into any sewer or drain the contents of any cess-pool or privy vault, unless express permission is granted by the Common Council, who shall charge for the privilege thus granted any sum not exceeding one hundred dollars per annum. Any person violating the provisions of this section shall, upon conviction before the Police Judge be fined in any sum not exceeding one hundred dollars.

Draining Vaults on Adjacent Property. 14. Any person having the right to tap any public sewer, who shall, by means of pipes or other communication, drain the cellars or vaults situate upon property adjacent to their own, upon

conviction thereof before the Police Judge, shall be fined in any sum not exceeding one hundred dollars; and, upon a second conviction for the same offense, shall be barred from the further right to drain into said sewer.

Notice to Property Owners to Drain Into Sewers. 15. The Common Council, upon the completion and acceptance of any public sewer, shall direct the Mayor to give thirty days' notice to the owners or tenants of all hotels, restaurants, boarding houses, drinking saloons, hospitals, or infirmaries, having a frontage on the street wherein such sewer is laid, that they will be required to make connections with such sewer, under the provisions of this ordinance. All persons who shall fail to comply with the requirements of such notice within thirty days after such notice shall be served, upon conviction before the Police Judge, shall be fined in any sum not exceeding one hundred dollars.

Publication. 16. This ordinance shall be in force from and after its passage and publication once a week for two consecutive weeks in the ———————— and the City Clerk shall also cause this ordinance to be published once in each of the following newspapers.

Following is another provision which has been found valuable:

Private Sewer—Permit—Cost of Tapping. Wherever any sewer, sewer pipe or underground drains has heretofore been or may hereafter be constructed in or along any street or alley of this city under a permit by virtue of the ordinance, rules or regulations of said city on the subject of tapping sewers, any property owner along the line of said sewer, sewer pipe or underground drain shall have the right to tap the same for house drainage purposes, if, in the opinion of the City Civil Engineer, said sewer, sewer pipe or underground drain is of sufficient capacity to accommodate such additional drainage: Provided, however, That if such sewer, sewer pipe or underground drain shall have been constructed wholly at private expense, the person desiring to tap the same shall pay to the person or persons originally constructing said sewer, sewer pipe or underground drain, such sum for said privilege as the City Civil Engineer and the members of the Sewer Committee (or a majority of them) shall determine to be fair and reasonable. A brief statement of the proceedings of said Engineer and Sewer Committee had in connection with any case contemplated by this ordinance, shall be reduced to writing and attached to the record of the original permit in the City Clerk's office.

The permit may read as follows:

Special permit is hereby granted .... to open ..... street between ..... and ..... streets, in front of No. ...., for the purpose of laying sewer pipes, ..., such proposed opening or excavation being about ..... feet long, 8½ feet deep and 3 feet wide.

This permit to be in force until four days from date of issue.

This license shall be void unless signed by the (Mayor, City Clerk, Chairman of Sewer Committee, City Engineer, as preferred), and countersigned by the (City Treasurer of City Clerk, as preferred), and the fee therefor fully paid.

Issued this ..... day of ....., 190..

Signed .....

Countersigned .....

The following regulations, when adopted, may be printed on the permit for convenient reference by the holder thereof:

Special Notices: 1. Dirt taken from trench must be replaced by ramming, and surplus material, if any, removed.

1. Wearing surface of any street or sidewalk not improved with asphalt, brick, wooden block, macadam or cement, must be replaced with the same kind of material and same depth found on the street.

3. In case of streets or sidewalks improved with asphalt, brick, wooden block, macadam or cement, under guaranty of a paving contractor, the surface must be replaced at the expense of the holder of the permit, with the same kind of material found and to the specified depth and to the satisfaction of the City Engineer.

4. In case of streets or sidewalks improved with asphalt, brick, wooden block, macadam or cement, not under guaranty of paving contractor, the trench must be filled and rammed to the satisfaction of the City Engineer to the bottom of the concrete foundation. The concrete and wearing surface will be replaced by the city and the cost taken out of the deposit required with the permit at the rate prescribed.

5. The City Engineer must be notified before filling is begun, and it must be inspected by him or his authorized representative.

(The deposit referred to is one at a fixed rate per foot of trench required from all applicants for permits to enter improved streets.

Rules for Laying Sewers and Drains. 1. In opening a street or other public way, all materials for paving or ballasting must be removed with the least possible injury or loss of the same, and together with the excavated material

from the trenches must be placed where they will cause the least practical inconvenience to the public. As little as possible of the trenth must be dug till the junction piece of the sewer is found, unless it is first determined to make a new opening into the sewer.

2. Whenever the sides of the trenches will not stand perpendicular, sheeting and braces must be used to prevent any unnecessary caving in.

3. No pipes or other materials for the drain can be used until they have been examined and approved by the City Civil Engineer or by one of his assistants, or by a duly authorized Inspector.

4. The least inclination that can be allowed for water closet, kitchen and all other drains not over six inches in diameter, liable to receive solid substances, is one-half an inch in two feet; and for cellar or other drains to receive water only, one-quarter of an inch in two feet.

5. The ends of all pipes not immediately connected with water closets, sinks, down-spouts, or catch-basins, are to be securely guarded against the introduction of sand or earth by brick or cement, or other water-tight and imperishable materials.

6. All pipes that must be open to drain cellars, areas, yards or gardens, must be connected with suitable catch-basins of brick, the bottom of which must not be less than two-and-a-half feet below the bottom of the out-let pipe, the diameter not less than three feet, and the form and construction of which are to be prescribed by the officers named in the third section.

7. No catch-basin can be built in the public street, but must be placed inside of the line of the lot to be drained, except when the sidewalks are excavated and used as vaults.

8. Privy-vaults shall not be connected with the sewers.

9. The inside of every drain, after it is laid, must be left smooth and perfectly clean throughout its entire length.

10. In case it shall be necessary to connect a drain pipe with a public sewer, where no junction is left in the public sewer, the new connection with public sewer can only be made when the officer, as named in regulation third, is present to see the whole of the work done.

11. Whenever it is necessary to disturb a wooden drain in actual use, it must in no case be obstructed without the special direction of one of the officers named in regulation third. No pipe-drain can be laid above the bottom of the wooden drain, whether in actual use or not, unless the pipe is made to rest either on puddled earth, brick, or stone. In no case will it be allowed to let drainpipe rest on wood or other perishable material.

12. The back filling over drains, after they are laid, must be puddled, and together with the replacing of ballast and paving, must be done so as to make them at least as good as they were before they were disturbed and to the satisfaction of the City Civil Engineer, and the drain-layer will be held responsible for any subsequent settlement of the ground. All water and gas pipes must be protected from injury or settling to the satisfaction of the City Civil Engineer.

13. Every pipe-layer licensed by the Board of Public Works must enclose an opening which he may make in the public streets or alleys, with sufficient barriers, and must maintain lamps at the same at night, and must take all other necessary precautions to guard the public effectually against all accidents from the beginning to the end of the work, and can only lay drains on condition that he is to be held liable for all damages that may result from his neglect of any necessary precaution against accidents to persons, horses, vehicles, or property of any kind.

14. In case a water or gas pipe should come in the way of a drain, the question of passing over or under the water or gas pipe, or of raising or lowering it, must be determined by one of the officers named in regulation third. In no case can the pipe-layer be allowed to decide the question himself.

15. No exhaust from steam engines can be connected with the private or public drains, and no blow-off from steam boilers can be so connected.

16. Such information as the City Civil Engineer may have with regard to the position of junctions will be furnished to the drain-layers; but at their risk as to the accuracy of the same.

17. When any change of direction is made in the pipe, either in a horizontal or vertical direction, curves must be used. No pipe can be clipped in any case.

18. Sewers shall be tapped at a point between the springing line and the quarter of the arch.

19. All bricks, cement and other refuse shall be removed from the sewer tapped before the slant is placed in position.

20. A slant pipe, and a pipe with an eighth bend shall be used, the edge of ner wall of the sewer tapped.

21. Connection with pipe sewers shall be made with Y branches and eighth bends.

22. The pipe shall be laid in a straight line, and with a uniform grade of not less than one-fourth ($\frac{1}{4}$) inch to the lineal foot.

23. All joints must be made water tight with hydraulic cement.

24. Each joint shall be carefully cleaned inside before the next pipe is laid.

25. All connections are to be inspected between the sewer and the property line, in streets and alleys.

26. Notice shall be given when a connection is ready for inspection, and no connection shall be covered until inspection is made.

27. All back filling shall be rammed, and surplus dirt removed at once, and street replaced at once in original manner with same material as is on the street.

LOCATION OF PUMP—GRADE FOR SEWER.

1. Is it practical to install a water pump on a level 15 feet above water surface and with a suction 1,000 feet long having a grade down from the pump to the well where the intake will be inserted?

2. It is proposed to lay a drain pipe of 900 feet of 15 inches and 2,000 feet of 12 inches to be used as collector for a district with a population of about 1,000 people, with a grade of 4 inches per 100 feet. Is it a grade sufficient? If not, what will be the minimum (separate system)? SUBSCRIBER, ——, Quebec.

1. If the pump is 15 feet above the surface of the water in the well it will operate, provided the suction pipe is perfectly air tight. Any slight leakage in the pipe will interfere with the efficiency of the pump and the friction of the flow in the long suction pipe will also reduce its efficiency.

2. The grade is sufficient if the sewer flows one-quarter full or more. Much of the time a sewer of 15 inches diameter serving so small a district on the separate system would not flow one-quarter full. The size of the sewer might well be reduced to 12 or even 10 inches if there is no storm water from streets or roofs to be taken care of.

APPARATUS FOR WASHING BROKEN STONE WANTED—CITIES USING SEPTIC TANKS.

I would like to know where I could purchase an outfit for washing broken stone of ½ to 1 inch size used in a sewage disposal plant, one operated by gasoline engine preferred. I also need a pump for furnishing water to same. Any information will be very much appreciated.

Can you give me a list of American cities using the septic tank and single or double contact-bed method of sewage disposal? G. C. W., ——, N. C.

The first question is referred to our readers. Probably our correspondent will get the best satisfaction from a plant designed by himself. A revolving drum with perforations to let the water out and keep the stone in, with a perforated pipe in the axis to supply the water under pressure ought to do good work if properly operated. If the drum is slightly inclined the clean stone will deliver itself at the lower end as rapidly as it is fed into the upper end.

With regard to sewage disposal, the following plants have been described ni MUNICIPAL ENGINEERING: Downers Grove, Ill., septic tank and sand filtration, vol. xxxi, p. 48. Baltimore, Md., proposed, septic tanks, sprinkling filter, settling basins and intermittent sand filters, vol. xxxi, p. 47. Andover, Mass., septic tank and filtration, vol. xxix, p. 36; Gardner, Mass., roughing filters; Madison, Wis., septic tanks and intermittent or sprinkling filters; Pawtucket, R. I., septic tanks and intermittent filtration, vol. xxix, p. 36; Columbus, O., experimental plant, vol. xxix, p. 34; Shelby, O., settling tanks and filter beds; Kenton, O., septic tanks and contact filters; Collinwood, O., railroad shops, septic tanks and contact beds; Delaware, O., septic tanks and contact beds; East Cleveland, septic tanks and double filtration; Mansfield, O., septic tanks and contact filters; Westerville, O., septic tanks and contact beds; also several institutions, vol. xxviii, p. 279, and vol. xxvii, p. 34; Plainfield, N. J., septic tanks and contact beds, vol. xxvii, p. 37. There are a number of plants in Massachusetts using various methods of filtration, with and without septic tanks, such as Framingham, Gardner, West Gardner, Marlborough, Clinton, Brockton, Andover, Spencer, Southbridge, Concord, Westborough, Natick, Leicester, also plants at Saratoga Springs, Mt. Vernon, White Plains, N. Y., Marion, Iowa, etc.

Additions to this list will be thankfully received.

GARBAGE DISPOSAL.

The City Club of Englewood, N. J., is considering recommending to the city government the establishment of a municipal garbage collection, the ashes and unburnable refuse to be used for filling in, the garbage to be buried in a sanitary manner and the burnable refuse to be burned out doors at the dump.

(a) Have you any statistics on hand showing the average cost of such collection and disposal in towns of about 10,000 inhabitants?

(b) Have you a copy of a model set of specifications to be used in making a contract for such work, showing type of wagons to be used and regulations regarding collection by drivers, separation of materials by householders, disinfection of garbage before burying, the method of burying the garbage and the cleansing of carts, cans, etc.?

(c) Can you tell me if the question as to whether a town has a right to make an exclusive contract for the collection and disposal of garbage, ashes and refuse, thereby putting other collectors out of business, has been settled by the courts of (1) New Jersey or (2) United States?

(d) Can you give me the names of some cities of about 10,000 inhabitants with a municipal garbage collection where the cost of such service is recovered from

the citizens (1) by an increase in the tax rate, (2) by charging each householder for service rendered, and (3) by an equitable compromise between them?
F. R. D., Englewood, N. J.

(a) There is little known of the cost of collection and disposal of refuse in towns of about 10,000 population in this country, because few towns of this size or of much larger size do this work at public expense or under any system which will show the cost. Few have any system whatever. The amount of refuse removed and the cost of removal are shown for cities of more than 25,000 population in Bulletin 20 of the Bureau of the Census, Tables 12, 21 and 29.

(b) Ordinances governing methods of collection will be found in MUNICIPAL ENGINEERING, vol. xix, p. 333, for Ft. Wayne, Ind., vol. xx, p. 329, for Lafayette, Ind. Description of the methods in use in Toronto will be found in vol. xix, p. 392. Newark, N. J., has a good ordinance. Trenton, N. J., can give some detailed information on garbage disposal.

(c) No New Jersey decisions are at hand. In Ohio exclusive contracts for collection and disposal of garbage can not be made, but in Michigan they can.

(d) The almost universal custom in the small cities is to charge the householder for the removal of garbage and it is almost as universal in cities of 10,000 or less to require the householder to remove his own refuse, a very few having ordinances with penalties for failure to remove refuse.

Our correspondent would like to hear from those who have any information on these questions and if it is sent to us we will forward it to him and also collect and prepare it for future publication.

Almost every number of MUNICIPAL ENGINEERING for the past five years or more has some discussion of these questions and they are still far from settlement.

INFORMATION ON PAVING BRICK TESTS.

Can you refer me to a good work on vitrified paving brick tests? I would like to get the results of tests on brick in different parts of the country and what is considered a standard test for paving brick.
J. W. G., ——, O.

Wheeler's "Vitrified Paving Brick" ($1) gives the results of tests made in 1894 of many brick from states tributary to St. Louis, from West Virginia to Kansas, Baker's "Roads and Pavements" ($5) contains full description of the standard tests of paving brick adopted by the National Brick Manufacturers' Association and other trade and technical bodies.

The best source of information on this subject is the back numbers of MUNICIPAL ENGINEERING. Reference may be made to many articles, principal among which are the following:

"Paving Brick Testing and Inspection," by Prof. A. N. Talbot, vol. xxx, p. 227.

"Tests for Paving Brick," giving some comparative results of rattler and absorption tests, vol. xxx, p. 427.

"Qualities of Brick," giving results of absorption, freezing, crushing, fire, acid and abrasion tests of vitrified and sand-lime bricks, vol. xxviii, p. 217.

"Paving Brick Testing and Inspection," giving standards for rattler losses for various classes of traffic, vol. xxviii, p. 238.

"Experiments on the Value of the Absorption Test for Paving Brick," vol. xxv, p. 156.

"Standard Methods of Testing Paving Brick," giving the methods adopted by the N. B. M. A., vol. xxii, p. 39. There are several earlier articles on this subject, but this one gives the final conclusions from the preceding discussions.

Results of tests are given in vol. xxi, p. 97; xiv, p. 298; xxii, pp. 284 and 363; xvii, pp. 215 and 375; xi, p. 326; x, p. 393; ix, p. 43; viii, pp. 172 and 200; vii, p. 283; vi, p. 230; v, p. 19, and elsewhere.

CITY OWNERSHIP OF ROAD ROLLER —ESTIMATES OF PIPE LAYING.

Is it advisable for a city to purchase a road roller for rolling partly clay and gravel streets? Will it be a benefit to have them turnpiked and then rolled 3 or 4 times a season?

Where can I get information regarding how to figure on sewer and water pipe laying, how to figure on the different depths and material, also to the different soil and sheeting?
J. S., South Milwaukee, Wis.

A road roller well used is a most excellent investment for any city having many macadamized or gravel streets. The roller can also be used successfully at times on dirt streets. Cities which have used such rollers intelligently report that they are worth many times their cost. In other cities new officials coming in with no knowledge of good methods of maintenance of roads have neglected them and put the road roller in the background and therefore can not make satisfactory reports.

Perhaps the best places to get the information desired about trenching and pipe laying are Folwell's "Sewerage" ($3) and "Water Supply Engineering" ($3); Turneaure and Russell's "Public Water Supplies" ($5) and Gillette's "Handbook of Cost Data" ($4). There are also many articles in back numbers of MUNICIPAL ENGINEERING on the subject.

THE CRUSHED STONE TRADE.

I have been contemplating taking a few stone crushers and a gang of men into some of the rocky parts of Pennsylvania (or surrounding country) and manufacturing crushed rock to be sold in New York, Philadelphia, Pittsburg, perhaps Rochester and Buffalo, or in fact to be sold at any point where the market price will warrant my paying the freight rates.

What I wish to know is the market value of crushed rock at the points I have mentioned and also what you think of the venture. W. J. D., Elizabeth, N. J.

The answer to this question is one which requires a close study of the fluctuations in the demand for the material, as well as the possibility of competing in quality and price with the stone already on the market. In a country where a small town buys a stone crusher, leases a stone quarry perhaps within the village limits and crushes all the stone it needs for street making and repair, there is not much chance for selling stone shipped in from a distance. Where a city, like New York, has an unlimited supply of trap rock and hard limestone within and immediately adjacent to its own boundaries and much more within barging distance, a softer material can scarcely compete if it has any railroad rate to pay or the specifications are in the least rigid. In other words the stone crushers had better be taken to the immediate vicinity of the markets named and set to work on local quarries, than to attempt to ship broken stone from any appreciable distances.

COST OF MACADAM PAVEMENTS.

I am interested in macadam and want for comparison information as to prices charged at other points for this work. Have read your publication monthly and noted contracts let, but prices given are in total and do not give an idea of cost per square yard or running foot.

Can you give me information as to price charged per square yard or lineal foot, and how deep it is customary to lay macadam, at other points, naming same?

V. S. G., Tucson, Ariz.

It is impossible to give prices for macadam roads without knowing cost of broken stone, including freight, depth of stone necessary, character of construction, cost of labor, etc. Baker's "Roads and Pavements" gives discussions of these points and from the data there given an estimate for a given locality can be made approximately. It is evidently much cheaper to build a macadam road by dumping a few loads of stone in a driveway 8 feet wide than to excavate say 14 feet wide, put in drainage, roll the subgrade, put in the stone in layers thoroughly rolled and finish with fine stone thoroughly wet and rolled. The one costs little more than the cost of hauling and spreading the stone. The other costs perhaps three times as much. There are all grades between. The annual reports of the department of highways of New Jersey, office at Trenton, N. J., give in detail the cost of roads built in that state each year. Some of these figures are given in articles in MUNICIPAL ENGINEERING. The latest of these is vol. xxx, p. 412.

As to depth of macadam, there is diversity of opinion. New Jersey is building macadam roads 6 inches thick on some soils and with light traffic, while under other circumstances it builds with 6 inches or so of Telford with 6 to 12 inches of macadam on top. It is common to make macadam roads 12 to 15 inches thick in the center, reducing to 6 or 8 inches at the sides. Cost per square yard depends largely on the thickness, and this in turn depends on the character of the subsoil and travel and the judgment of the engineer concerning them and the economy of maintenance of the road. The Highway Commissioner of Massachusetts, office in Boston, and the State Engineer of New York, office in Albany, publish annual reports giving details of cost of roads built in those states, which are ordinarily much more expensive than the New Jersey roads.

There are many statements of cost of macadam in MUNICIPAL ENGINEERING besides the articles on New Jersey roads referred to, such as vol. xxix, p. 32; vol. xxviii, p. 242; vol. xxvi, pp. 86, 100, 405; vol. xxv, pp. 172, 207; vol. xxiv, p. 57; vol. xxiii, p. 375; vol. xxi, p. 159; vol. xviii, p. 260; vol. xiv, pp. 222, 358, 386; vol. xiii, p. 145; vol. xi, pp. 154, 310; vol. x, pp. 126, 202; vol. viii, p. 263, and others.

DISTRIBUTION OF NATURAL GAS.

Can you give me any information about handling natural gas in small towns? We are getting some 100-pound wells five miles out and need information on the subject. M. H. C., Bowling Green, Ky.

The handling of natural gas is not greatly different from that of artificial gas. The main supply lines must ordinarily be of stronger pipe, as pressures are much greater. There must be very effective regulation with pressure reducers for the distribution and service pipes. The natural gas may be dryer than artificial gas, so that the arrangements for draining pipes and removing water from them often need not be so elaborate as in artificial gas systems.

The books on gas manufacture and distribution are of English authorship. Some of the most prominent are the following: O'Connor's "Gas Engineer's Pocket Book" ($3.50); Clegg's "Manufacture and Distribution of Coal Gas" ($15); Hughes' "Construction of Gas Works" ($2.20); King's "Manufacture

and Distribution of Coal Gas" ($30); Newbigging's "Handbook for Gas Engineers and Managers" ($6); Richard's "Manufacture and Distribution of Coal Gas" ($12).

DATA ON MUNICIPAL OWNERSHIP OF WATER AND LIGHT PLANTS.

Can you send me any information in regard to municipal ownership of water and electric plants? What I wish to get is a comparison of the cost to the taxpayers for light and water between municipal and private ownership. Also the usual method of looking after the business and mechanical ends of a municipal plant. In our case, we have a plant owned and operated by the city. A committee of the council look after the financial or business end of the plant. The writer is in charge of the mechanical part of the business. Our rates are 10 cents per kilowatt for lighting and from 6 to 25 cents for water per 1,000 gallons. All metered, both light and water. Our coal costs us $2.70. Do you know of any private corporation that furnishes light and water for less than the above figures? We have about 4,000 people. There is a gas plant here, operated by a stock company. They have no franchise. They pay a small tax on their plant, but pay nothing into the city treasury for the privilege of competing with the city plant or for laying mains in the streets. They have been selling gas for the past 30 years and the committee is in favor of collecting something from them in the future, either by compelling them to pay for a franchise or by a per cent of their gross receipts. It is claimed by some that municipal ownership of light and water plants is a failure and that many cities are selling out to private parties. Is municipal ownership a failure?

G., ————, Iowa.

The "Manual of American Waterworks" ($3), gives water rates in many cities and comparisons may be made between rates in cities under municipal and private ownership. Some comparisons are made for Illinois cities in the January number of MUNICIPAL ENGINEERING, vol. xxxii, p. 20. These show the rates to be usually lower under municipal ownership.

A volume on water, gas and electric light plants was published several years ago by the U. S. Department of Labor, from which similar comparisons can be made. Some of these have been made in this magazine. Following are some of the articles, making comparisons and also some discussing various phases of the questions involved:

"Government Ownership of Public Service Industries," vol. xxxi, p. 273.

"Municipal Gas Works," vol. xxx, p. 346.

"Municipal Ownership of Gas Works," vol xxx, p. 49.

"Cities Owning their Electric Lighting Plants," vol xxx, p. 354.

"Private or Municipal Ownership of Waterworks," giving a comparison of rates showing lower rates in municipal plants, vol. xxx, p. 367.

"St. Louis Municipal Lighting," vol. xxix, p. 200.

"Cost of Municipal Lighting in Alameda, Cal. and Decatur, Ill.," vol. xxix, p. 27.

Lists of earlier articles on the subject will be found in vol. xxviii, pp. 103 and 230, vol. xxvii, pp. 273 and 274 and vol. xxi, p. 263.

WHERE ARE WATER RENTALS LIEN ON PROPERTY?

Can you furnish me with the names of any states where there is a law in force making a water bill a lien upon the property? G. C., Chelsea, Mass.

Water rentals are liens on property only where there is a statute so providing. New Jersey is the only state known to the writer which has such a statute. Court decisions are to the effect that under this law meter bills are not prior liens to mortgages previously given. Decisions in Massachusetts, Pennsylvania, Rhode Island, New York and Missouri, which states have no such statutes, state that water rentals in those states are not liens on property.

It is customary in some cities for landlords to pay water bills, in which case they would be liable for their payment, but where it is customary for the tenant to pay the bills the landlord or the property cannot be held liable for failure to pay in absence of statute or ordinance transferring the liability thereto.

Can our readers give information concerning cities and other states in which water rentals are liens on the property in which they accrue? Gas, electric light and power and heat bills would seem to belong in the same class and the custom or law regarding them would probably be applicable to water bills.

WATER SUPPLIES

Typhoid at Scranton—Salton Sea—Leakage of Torresdale Conduit—Brooklyn Water Supply Improvements—New Jersey Water Supplies—Chillicothe Water and Light Plant—Rogers Park Water Franchise.

Typhoid Fever from Scranton Water Supply.

The state of Pennsylvania took charge of matters January 3 on the watershed at Scranton, after the state board of health published a statement that, as a result of its examinations, typhoid bacilli had been found in the water from the Elmhurst reservoir.

The city had been using this water, but since the outbreak of typhoid fever a few weeks previous Lake Scranton water had been used. There is an automatic arrangement, however, whereby when low, Lake Scranton water is reinforced by a supply from the Elmhurst dam, so no one knows how far Lake Scranton water had been poisoned.

Irrigation Affected by the Salton Sea.

The Imperial Water Users Association was organized January 16 at Imperial, Cal., by directors of six mutual water companies of which all water users in the Imperial valley are members. Resolutions were passed favorable to the reclamation service taking over the irrigation of this valley only on the basis of protecting the rights obtained under the desert land law. The new association will negotiate either with the reclamation service to this end or with the California Development Company for the purchase of its system.

Leakage of the Torresdale Conduit.

The opinion of Charles A. Hague, an expert engineer, who was called as a witness December 26 in the case of the city of Philadelphia against the firm of D. J. McNichol and others is that the Torresdale conduit would have been absolutely water-tight after six months or a year's usage. He declared that a coating of slime is bound to form upon the inside of any such water conduit and this coating forms a lining that makes the tunnel perfectly water-tight, time being all that is needed to complete the operation. He said that there would be no infiltration or leakage into the conduit unless the water in the clear water basin was allowed to drop more than four feet under its capacity of fifteen feet depth, which was practically impossible as the pumps are located and constructed.

Proposed Improvements for Brooklyn's Water Supply.

The annual report of the department of water supply, gas and electricity of New York City indicates that the department contemplates extensive improvements during the next four years in extending and enlarging the water system of Brooklyn. An expenditure of over $25,000,000 is involved in the plans, and in connection with them the engineers have prepared a table of what they believe will be the estimated population of Brooklyn within the next fifteen years and the amount of water which will be required to meet the demands.

Regarding the future work for improving and developing the supply the report says:

The development for Brooklyn in the way of increasing the supply would be to extend the infiltration galleries or wells so as to have a continuous line from Spring Creek to Suffolk county, only omitting the portion of the watershed covered by the larger towns and villages. The development of the shallow underground supply would be supplemented by wells driven below the impervious strata, and in this manner all the available water would be collected and delivered to the borough. This method of developing the supply will give a naturally filtered water, and any surface water which is not utilized under the present development would be purified by slow sand filters, thus giving a supply which would be entirely free from danger of any contamination.

The imperative need of additional sources of supply other than those which can be developed in the counties of Kings, Queens and Nassau has been already stated and the natural advantages of Suffolk county have been shown. The question of utilizing the Suffolk county supply for the additional water that will be required before any supply from up the state will become available is to be legally tested and a judicial determination made of the constitutionality of the law, which apparently prohibits the city from entering into Suffolk county.

For the distribution system a carefully studied plan is being made showing the exact size of all mains, both trunk and distribution, so that the extension of mains can be made along lines that will insure an ample supply of water for fire and domestic service. It is proposed to

extend mains in all sections of the borough and thus promote the development of the borough by providing the supply by the time it is actually required, instead of, as has been done in the past, waiting until the water is needed before any attempt is made to supply this need and to properly protect the citizens from loss by fire. It is planned to replace the more important tuberculated mains by new mains and to clean or replace the old mains in purely residential sections. The reduction in fire losses which has already been shown by the partial remodeling of the old distribution system will naturally result in a lowered fire rate, and Brooklyn, instead of having a high rate, as has been the case in the past, should have and will have an extremely low rate, if the present plans are carried out. The lack of hydrants on those mains which are large enough to supply sufficient water for fire purposes has been a cause of fire losses in the past, and a thorough remodeling of the hydrants, gates and cross connection systems will be made. Brooklyn has many types of fire hydrants in use at present, but a standard type, which represents the most advanced ideas in hydrant construction, has been adopted and used for the past two years, and all hydrants set in the future will be of this type, so that there will be a minimum expenditure necessary for repairs to hydrants and an increase in the efficiency of the system.

The high pressure fire service system, which has proven successful in Coney Island, and which undoubtedly will be an entire success in the other sections of the borough, will be extended so as to cover all the important business and manufacturing centers.

A table showing the estimated population and the daily consumption of water within the next fifteen years is as follows:

Year.	Population.	Consumption per capita. Gallons.	Average daily consumption. Gallons.
1905	1,379,000	94.3	130,000,000
1906	1,426,000	95.8	136,600,000
1907	1,474,000	97.3	143,400,000
1908	1,524,000	98.8	150,600,000
1909	1,576,000	100.3	158,100,000
1910	1,630,000	101.8	165,900,000
1911	1,685,000	103.3	174,100,000
1912	1,742,000	104.8	182,600,000
1913	1,802,000	106.3	191,600,000
1914	1,863,000	107.8	200,800,000
1915	1,926,000	109.3	210,500,000

Recommendations for improving the water system immediately for the proper protection against fire are made as follows:

First—Continuing the replacing of all mains laid prior to 1860, with the possible exception of those laid in streets devoted wholly to residential purposes, where the old mains may be cleaned and thus give adequate supply if properly fed at the end of each block by trunk mains.

Second—The cutting out of many of the old hydrants and the setting of many new hydrants, so that the average distance between hydrants shall not exceed 200 feet, this distance being reduced to 150 feet in the more important sections. It will also be necessary to dig up practically every hydrant in the city's service and surround the same with a drain, cleaning the waste opening so that the hydrant will properly free itself from water and thus prevent freezing in the winter time.

Third—The cross connecting of the mains laid subsequent to 1860 and the placing of additional gates so as to reduce the area from which the water is shut off in case of necessity of repairing any main or hydrant.

Fourth—Laying additional trunk mains from the source of supply, so that the frictional loss in the mains can be reduced to such an extent that the equivalent elevation of water at any point served by the Ridgewood system will not be less than 140 feet above mean high tide, thus giving a pressure equivalent to not less than 60 feet of water at any point in the borough.

Fifth—Laying boundary mains for the high service districts, so that the dead ends, which at present cause frequent and just complaint, can be done away with.

The work thus outlined, as can readily be seen, is one of great magnitude and will require the expenditure of a large sum to accomplish it, but with the removal of the constitutional limitation in the case of bonds required for the extension and improvement of the water supply the necessary appropriations can and should be readily granted so as to complete the above work within the next three years. The expenditure will certainly be amply warranted by the returns.

Special stress is laid on the leakage of water, which, according to an inspection made by the officials of the department in 6,000 buildings, amounted to 366,000 gallons in twenty-four hours.

Valuable Report on New Jersey Water Supplies.

The findings of the Potable Water Commission appointed under a resolution of the last legislature of New Jersey for the purpose of ascertaining the extent of the potable water supply of the state, have been submitted to Governor Stokes, who in turn submitted the report to the House of Assembly January 15. The substance of the report is as follows:

One—The underground potable water supplies of the state are of wide extent, great importance and good character, but are not everywhere equally available. One hundred and ten municipalities report public supplies drawn exclusively and nineteen others partly from this source. The total population dependent wholly or in part on these waters and including the rural districts where there are no water companies is approximately 978,000.

Two—Underground water when collected in wells is owned absolutely by the owner of the soil, and may be treated by him as merchandise. We know no good reason why the state at present should attempt to acquire ownership of any of this water, or the wells by which it is reached. If public ownership of any part of these supplies is desirable the problem can be best dealt with by the municipality directly concerned.

Three—There are 108 fresh water lakes and ponds in the state whose area is larger than ten acres, and whose aggregate area is about 14,000 acres. Some of these are now, and others will be, important sources of potable water. The

title to these lakes, i. e., the land under the lakes, formerly was in the Boards of Proprietors of East and West New Jersey, now rests absolutely in private owners, and never vested in the state. These owners have certain well-defined riparian rights in the water of the lakes, but they do not own it absolutely. The control of fresh water * * * in lakes and ponds that have outlets in such streams (subject to the interests of riparian owners therein) resides in the state * * *. The state also possesses the power to enact and enforce laws to prevent pollution of all potable waters. It is not necessary, therefore, for the state to acquire title to the lakes in order to preserve the quantity or quality of the potable waters.

Four—It is recommended that the state ultimately acquire ownership in fee of all natural lakes over one hundred acres. A few, notably Culver's Lake, Lake Owassa (Long Pond), Swartswood Lake, Green Pond and Budd's Lake, should be acquired in the near future, in order to preserve them for the use of the public in boating and fishing. Under private ownership it is only a question of time when all the desirable lakes will be closed to the public or the privilege of boating and fishing restricted to the few who can afford to pay for it. The powers of the Forest Park Reservation Commission should be increased to permit them to acquire lakes in behalf of the state.

Five—The extent and character of the water supplies of the state have been exhaustively discussed in the reports of the State Geological Survey. The supplies are ample for all our population and for a long period in the future, provided surplus waters are conserved and contamination prevented, but their complete utilization will entail the expenditure of vast sums of money. With increasing population, the dangers of contamination and the difficulty of securing pure supplies will rapidly increase. Nature has provided an abundant supply; it remains for the people of the state to administer it wisely. Nearly one-half the entire population of the state depend upon the Hackensack and Passaic watersheds for water supplies.

Six—The Court of Errors and Appeals has decided that the ownership of the waters in the lakes and streams tributary to them resides in the state, both as trustee for all the people and also in virtue of the state being the lowest riparian owner on all tidal streams—this ownership, however, being qualified, first, by the common-law rights of riparian owners and, second, by the grants to take and divert water, heretofore made, either by special legislative charters or under general laws.

Seven—Previous to 1875 many special charters were granted by the legislature conferring corporate power to acquire the right to divert and use the waters of lakes, ponds and streams for the purpose of supplying cities and towns in the state with water for consumption. Since 1875 general laws have been enacted under which (1) private corporations may be organized for supplying municipalities with water, and (2) municipalities may take water from the streams. The extent of the rights thus granted, and the question whether any companies or municipalities are exceeding them, are questions which the courts must ultimately determine. The commission has no power to pass finally upon them.

Eight—The rights of water companies to abstract waters from the rivers as against the state rest either upon their chartered powers, upon their status as riparian owners, or upon both of these combined. Perhaps additional rights are conferred in virtue of contracts to supply municipalities with water. If so, these rights are measured by the contracts in force, and are variable, expiring with them. The Court of Errors and Appeals has held that riparian owners, as such, have no right to divert water from streams to make merchandise of it. Most water companies which are diverting water have either special charters granted by the legislatures previous to 1875, or are incorporated under the general water act of 1876, and its supplements. An exception appears in the case of the East Jersey Water Company, which, by the record of a recent case (attorney-general vs. Hudson County Water Company), is diverting large quantities of water from the Passaic. This company was incorporated in 1889 under the general corporation act of 1875, and its supplements. This act granted the power to incorporate, for the purpose of "damming rivers and streams, including the storage, transportation and sale of water, * * * with the right to take rivulets, etc.," but provided that it should not apply to "any river or stream of less width or volume than the Delaware River, ordinarily at Phillipsburg, in this state, below its junction with the Lehigh." Since the Passaic River is much smaller than the Delaware, it does not appear that the East Jersey Water Company, under its charter, has the right to abstract water from the Passaic River. The Court of Errors and Appeals has recently pointed out that in many of the special charters granted previous to 1875 by the legislature, "there was no grant of the right to interfere with the natural course of the water, other than such as may be implied from the grant of corporate powers that could not be exercised without the diversion of water from its natural courses." In view of these facts, we recommend that the attorney-general examine carefully the grounds on which the various water companies are taking and diverting surface waters, in order to recover to the state any rights in the waters of the streams to which in law and equity it may be entitled.

Nine—It is impossible to determine the monetary value of the water supplies of the state. Water is now sold to many cities at rates varying from $65 to $80 per million gallons. This represents the value at the point of delivery. The value at the point of intake is, of course, much less.

Ten—The state already owns the waters, subject to the rights of riparian owners, except so far as it has parted with them by grants. Effective measures should at once be taken to prevent any further diversion under these grants and charters in excess of rights actually and undoubtedly conferred by them.

Eleven—The decision of the Court of Errors and Appeals in the case of the attorney-general vs. the Hudson County Water Company, did not deal directly with the rights of municipalities or water companies to divert water from the river as against the state, but rather with their right to transport by pipes such water to another state. It was assumed for the sake of argument that the water companies directly concerned had full power to divert water from the streams, but, granting this, the right of the legislature to forbid its transportation into another state was upheld, and in upholding this right it asserted the control of the state over the water in the streams

and ponds, subject to the limitations already indicated.

Twelve—The commission makes the following recommendations regarding a state policy for control over the potable water:

(a) The appointment of a permanent water supply commission which shall have power to pass upon all new plans for public water supplies when these shall affect surface waters, and to approve all future contracts for surface water supplies entered into by municipalities.

(b) A restriction of the right of any municipality or any water company to acquire, take or condemn lands or water rights for any new or additional supplies until it has secured the consent of the commission to its plans.

(c) Communities and persons affected by the proposed plans should be given an opportunity to be heard and their objections weighed.

(d) Provision should be made for equitable compensation for all damages resulting from the carrying out of such plans.

(e) The decision of the commission should be subject to review by the courts.

(f) The commission should have power to subpoena witnesses and documents, require testimony, employ the necessary assistants, and require annual reports from all municipal water boards and private water companies of all matters pertinent to a proper supervision of the state's potable waters.

(g) For all water hereafter diverted in excess of the amount at present rightfully and legally diverted by existing municipal water boards or water companies payment should be made at a fair rate to the state. Companies hereafter established should be permitted to divert without payment a daily amount equal to 100 gallons per capita, according to the population of the municipality supplied at the last preceding census. On the basis of the past increase in the consumption of water, receipts from these sources in the course of a few years would amount to many thousands of dollars annually, even at a low charge. If the courts should ultimately decide that the state had the right to require payment for all water hereafter diverted, the wisdom of exacting such payment would then be a matter for the legislature to determine.

Thirteen—Both the Geological Survey and the Passaic Valley Flood Commission have reported plans for the construction of storage reservoirs to conserve the water supply and restrain floods. For reasons stated in the body of this report, we believe that the plan offered by the Geological Survey is preferable to the other, but in view of the great interests involved and our inability to inquire into the engineering details, we urge that the two plans be referred to the permanent state water commission (if such commission be appointed) for investigation of their relative merits from an engineering standpoint.

Chillicothe Cannot Issue Bonds for Maintaining and Operating Water and Light Plant.

An opinion was rendered at Jefferson City, O., recently in the case of the city of Chillicothe against State Auditor Wilder, a mandamus proceeding to compel the state auditor to register $100,000 of bonds for the purpose of erecting, purchasing, maintaining and operating a waterworks and electric light plant for the city of Chillicothe.

Judge Gantt, by whom the opinion was written, holds that the state auditor did right in refusing to register the bonds, because they were issued without authority in that there were two propositions submitted at the same time and as one. One proposition provided for the purchase of the plant, and the other for maintaining and operating it.

The amendment adopted to the constition in 1902 allowing cities to bond in excess of the 5 per cent constitutional limit not exceeding an additional 5 per cent, for the purpose of erecting or purchasing whatever waterworks, electric light and other light plants to be owned by the city does not allow the other proposition for maintaining and operating. The plant must be maintained independently of this constitutional limit of taxation.

The city of Chillicothe has an indebtedness of $20,000 and this proposed $100,000 would bring its indebtedness to more than the constitutional limit for ordinary purposes and for which the vote for maintaining the plant must be taken.

Judge Gantt's opinion suggests that where a joint plant is to be constructed the proposition should be submitted under the name of combined waterworks and electric light plant. The writ of mandamus is denied.

Rogers Park Water Company Has Not Exclusive Franchise.

The appellate court handed down a decision January 7 at Chicago declaring that the Rogers Park Company did not have the exclusive right to maintain a water system in Rogers Park and holding that the city of Chicago could lay mains in the suburb and supply the residents with city water.

The court's opinion is, in part, as follows:

We have considered the cause as though the element of a subsequent annexation of the village of Rogers Park to Chicago did not enter into the question, and we do not think that it is necessary to take that element into account to arrive at a proper conclusion. But certainly the fact that the life of the municipal corporation which is alleged to have made the exclusive and estopping contract has ceased, that the territory involved has become a part of the city of Chicago, that in consequence the taxing power of the city has extended itself over the inhabitants thereof, and that their property must be taxed equally with that of all other citizens of Chicago to make up a deficit in the water revenue of the city, if there should be one, does not detract from the force of the argument against the contention of the appellant.

Is it not possible, on the contrary, that the citizens of the territory formerly com-

posing the village of Rogers Park and now a part of the city of Chicago, have a legal, equitable anl moral right under these circumstances to demand that the city of Chicago should give them their water supply on the same terms it gives such supply to other citizens?

In referring to the construction given by the village council of 1888 to the word "exclusive" in connection with the grant the opinion states:

It does not seem probable to us that they meant by any such expression not only to forbid themselves to give a third party a similar right and to estop themselves from maintaining their own water supply, but also to make it possible for the action of a subsequent council, ratified by a majority of the voters, to impose on every inhabitant of the territory all the burdens but not all the rights of advantages of a citizen of Chicago.

GAS LIGHTING

Washington Gas—Municipal Gas Plant.

Cheaper Gas for Washington, D. C.

The Madden 75-cent gas bill was reported to the District committee January 16 by the commissioners of the District of Columbia, who stated that after much consideration they firmly believe the price of gas in the District can be reduced and should be reduced and they are in favor of making it 75 cents if that will afford a fair return to the company. They also recommend that Congress require the companies manufacturing gas in the District to make annual reports upon their receipts and expenditures.

Personal Experiences With a Municipal Gas Plant.*

BY C. E. MOORE.

The town of Santa Clara has the only municipal gas plant on the Pacific Coast, so far as known to the writer. There is nothing remarkable about this plant except the fact that it is owned and operated by the municipality. The writer has for several years been acting as consulting engineer for the town, and as such had charge of the construction of the water and electric plants which preceded the gas plant. When gas was taken up it naturally followed that the same arrangement was carried along as regarded that plant also. Therefore, it will be understood that the engineer, as well as the council, had much of the gas business to learn, and that the writer of this does not assume to be an expert in gas matters. However, having been identified with the enterprise since its establishment, and continuing at present to be in touch with it, and since the plant occupies rather an unique position, it has seemed that a brief account of its career may be of interest.

The account will naturally fall somewhat into the line of a discussion of municipal ownership, but this will not be with the object of establishing any extreme views, but rather with the idea of drawing such inferences as are possible from our experience. Regarding the broader question of general municipal ownership, the writer has come in contact with it in many other places, and inevitably his views are somewhat colored by the sum total of all this experience, but the effort will be made here to confine deductions as strictly as possible to those following from this case.

To make the situation clear, it will be necessary to first state, in a brief way, the causes which led up to this particular municipal ownership. Twelve years ago the town of Santa Clara took up the ownership of water supply. For this there were several powerful reasons, the chief one perhaps being the necessity for better fire protection. This plant was successful from the start. There was also a desire for a more extended system of street lighting, and it seemed advisable to take that up in connection with the water plant. This plant was installed ten years ago. It also was satisfactory, and the people came to have considerable pride in the plants. Every town, like an individual, likes to have something to talk about, and the municipal plants came to be the thing to talk about in Santa Clara. The matter now passed beyond the case of necessity, and the later movements along this line have been largely the result of the impetus of the idea. Municipal ownership became a spe-

*A paper before the Pacific Coast Gas Association.

cialty. Commercial lighting was taken up by buying out the property of the electric light company, remodeling and extending the system, and combining it with the street lighting. Current for this purpose was formerly generated by the town, but for several years past has been bought from the San Jose Light and Power Company, and it is supplied by the standard long distance transmission lines.

Gas had been supplied by the San Jose Gas Company (later the Light and Power Company) for many years by a pipe line from their works. The condition of the town had been such that there had been little encouragement for the company to extend the lines. There had been no special effort to push the business, and the consumption was only 10,000 feet per day. However, with the coming of renewed life to the town, there began to be felt a desire for more extended service. Chiefly, the development of the gas plant may be considered as due to the idea which had taken root. There was no particular dissatisfaction with the company, and the movement was entirely devoid of enmity to it. Accordingly, all the property of the company in the town was purchased at a valuation made by an expert agreed upon by both parties. The transaction was amicable and satisfactory throughout. There has since been considerable increase in the consumption (chiefly for fuel purposes) and the output is at present 35,000 feet per day.

The price of gas was first fixed at $1.75 per 1,000, that being the price then charged by the company. Later, for service in San Jose, the company made the rate of $1.50, but no reduction was then made by the town. Still later, the company reduced the rate to $1.25, and the town followed with a reduction to $1.50, and is now selling at that rate. That is to say, the town has in the matter of rates pursued a very conservative course, and has made no reduction until virtually forced to do so by the company. Of course, there is no actual competition between the two, but inasmuch as they serve adjoining territory, it is in practice difficult to maintain a much higher rate in one than in the other. It will perhaps be apparent from the foregoing that an attempt has been made to manage the plant on business principles, and not to be carried away by any popular idea that something could be had for nothing.

About 20,000 feet of pipe was taken over from the company, and since that time about 50,000 feet have been laid. It has been necessary to do this work largely with unskilled labor. At the beginning the work done in remodeling the distribution system was from necessity advertised. The contractor who took the work was not accustomed to laying gas pipe. The blocks in many cases have very little fall, barely enough for surface drainage. Under these circumstances the writer put in force a system of laying to grades previously established by levels, and this system has been followed ever since. This is done so simply, with so little trouble, and with such good results from entirely unskilled labor in grading the trenches, that it would seem good policy for any company working in a flat country to follow the same system. In the old pipes, laid in the old way with a spirit level, there have been frequent traps and stoppages. In the new mains there have not been any at all. The number of drips is also kept at a minimum, and these are located at convenient points and where they will do the most good. It may be that some gas companies use similar methods, but so far as known to the writer they generally do not. The particular methods used had previously been developed on sewer work.

Now, as to the conclusions from our experience:

First, the plant and business need continual and watchful care. This is, of course, an unnecessary thing to say to men of experience, but it is a fact that is not fully appreciated by others. In our case the care has been provided, and consequently the business has been successful. It has been very fortunate that there were few changes of officials. The office of President of the Board (or Mayor) has not changed during all this time. The Chairman of the Water and Light Committee also has from the first been identified with the management. Questions of policy have been given careful consideration; just as careful as though it had been their own business. The result has been a good profit, but it is very easy to see how the balance might have been the other way. This is the chief danger that confronts any scheme of municipal ownership, namely, that men of ability may not be willing to give their attention to the business of the town or that the people will not have the good sense to keep men of that kind at the head of affairs.

Second, as to the ability to meet emergencies. We have recently had an experience of that kind growing out of the partial wrecking of all the plants by the earthquake. This rests upon the men, and not upon the system, and consequently goes back to the first question of management. In our case we feel no cause for regret, inasmuch as water was supplied in about 24 hours and gas in 3 days.

Third, the ability to provide extensions. In this particular the municipality is decidedly at a disadvantage. Whereas a company can in this case borrow money to meet a large increase in the demands upon it a municipality cannot do this except by a bond issue, which cannot be resorted to in all cases. Consequently it is necessary to look well ahead, and provide far in advance for such extensions of magnitude as are likely to be necessary.

Fourth, as to the attitude of customers. In these matters we are dealing not only with gas, but with human nature, and this is practically the same the world over. There is an occasional demand for lower rates, in the case of the town, as there would be with a company. There is the same distrust of meters. About half the consumers consider the collector and meter reader their natural enemy. The people's pride in the plant is chiefly in the abstract, and does not particularly affect their attitude toward bills and service. And yet it is not quite fair to leave the question at that, for there is a certain amount of feeling of individual ownership, which probably makes the conduct of these matters a trifle smoother than in ordinary cases.

Fifth, general conclusions. The conviction of the writer is that a municipality should hardly be advised to undertake the management of plants solely for the sake of profit, as an individual or company may do. There should in general be other and stronger reasons. In the case of water, there often are such reasons. As we leave water supply and look along the line of other utilities, we find that in general these causes have less force. This does not mean that gas should be supplied at cost. In the first place, in a developing community, extensions and increased facilities in every way will probably be called for. If gas is supplied at cost, all this must either be provided for in the first bond issue, which on account of its uncertainty is not practicable, or must be provided by taxation later.

Secondly, the question of exact cost is a precarious one at best. It must include all unexpected emergency expenses, and can really be determined only after a term of years. The probability is that selling at cost, as determined from ordinary running expenses, would finally result in the plant requiring support from other funds of the town.

To condense all this, we would say that a municipality, like an individual, should act with judgment and upon competent advice, and not be carried away by impulse in either direction. This is perhaps a condition which cannot be fully realized, but in this as in other affairs of life it is well to have an ideal.

NATIONAL ASSOCIATION OF CEMENT USERS

The Convention—Fireproofing and Insurance—Forms for Concrete—Art in Concrete Structures—Concrete Blocks.

The Third Convention of the National Association of Cement Users.

The Chicago convention of the National Association of Cement Users, with regard to interest in the convention sessions, equaled and even surpassed previous conventions. Being held in a city between those in which the two former conventions were held, it drew from the same districts and, for this reason, as well as trade reasons, it did not draw as many new attendants. This was an advantage so far as the discussions were concerned, because they could be a little farther advanced, so that, while they covered much the same ground as those of former meetings they were on a little higher plane and showed advancement in knowledge and appreciation of the value of the cement and concrete industries.

Cement sidewalks was the opening subject in a paper by Albert Moyer and one by George L. Stanley. The discussions at this session and at two subsequent experience meetings were participated in by many.

The first evening was devoted to the president's address, an elementary talk on the mechanics of reinforced concrete

by Prof. W. K. Hatt, and an exhaustive paper on forms for concrete construction by Sanford E. Thompson.

The concrete block was the subject of the first and third experience meetings and there were also papers by H. H. Rice, by R. D. Kneale on tests of blocks, by J. F. Angell on block machinery and a special session led by M. S. Daniels for the discussion of block problems. The waterproofing discussion was concentrated in one session with papers and talks by representatives of various systems of waterproofing. The materials of which sidewalks and blocks are made were separately considered by W. B. Fuller and by E. S. Larned.

The artistic side of concrete work was considered by A. O. Elzner and Chas. D. Watson and the finish of concrete surfaces by H. H. Quimby and Linn White.

The committee on fireproofing and insurance made a brief report through its chairman, E. T. Cairns, and the committee on laws and ordinances made one of some length and importance through its chairman, H. C. Henley.

Most of these papers will appear in this and later numbers of MUNICIPAL ENGINEERING.

Practically the list of officers of the previous year was re-elected, the only new names appearing being Spencer B. Newberry of the section on concrete blocks and cement products and Mentor Wetzstein of the section on machinery for cement users, elected by their respective sections.

The decision regarding the place of the next morning was left to the executive committee. Considerable sentiment in favor of Columbus, O., was expressed and the guarantee by responsible men from that city of even better accommodations than those at Chicago, with the convention hall in a building adjacent to the exhibit hall give that city an advantage in the arguments which it will be difficult to meet.

The official register of the convention was so defective by reason of omission of some names and of most addresses that no attempt is made to give it. The number registering was probably about 600.

The exhibition was after all the great feature of the convention, and, notwithstanding the interest and value of the convention sessions many men did not see the inside of the convention hall, but found all they seemed to want in the exhibit hall. There were so many who could not find space officially in the exhibit, but who nevertheless did more or less exhibiting in the aisles and the spaces of others that a full list of all the firms represented is impossible. Following is a fairly complete list:

American Carpenter and Builder, Chicago, Ill.

American Cement Roofing Co., Columbus, O., J. E. Hicks, cement roofing tile machinery.

American Hydraulic Stone Co., Denver, Col. H. H. Rice was in charge of the exhibit, with two assistants. A machine was in operation and their new hand power mixer was also on exhibition.

American Wire Fence Co., Chicago, Ill., W. A. Collins, spiral reinforcement for columns ready for use, and other forms of steel reinforcement for concrete.

Anchor Concrete Stone Co., Rock Rapids, Ia., concrete block machine.

Art Portland Cement Co., Kimmell, Ind., white Portland cement.

Ashland Steel Range Co., Ashland, O., concrete block machine.

The Atlas Portland Cement Co., had its usual comprehensive exhibit in charge of F. W. Clayton and J. E. Evans, of the Chicago office and P. Austin Tomes of the New York office.

Automatic Block Machine Co., Jackson, Mich., A. M. Haight, concrete block machine.

Automatic Concrete Tamper Co., Peoria, Ill., R. L. Allen, Kramer automatic power tamper for brick and blocks and gasoline engine.

The Ballou Manufacturing Co., Belding, Mich., W. D. Ballou, Pres., in charge, exhibited the Demorest Little Giant concrete mixer, one run by hand power with a capacity of 5 to 8 cubic yards an hour and one of same size, but heavier built, run by gasoline engine with capacity of 10 to 15 cubic yards an hour.

The Barrett Manufacturing Co., New York City, was represented by C. P. Gooding and made an excellent exhibit of roofing material.

Besser Manufacturing Co., Alpena, Mich., brick, block and tile machinery.

Blaw Collapsible Steel Centering Co., mold for sewer construction.

Booer Grinder and Furnace Works, Waterloo, Ia., slush concrete system.

Brandell Concrete Machine Co., Chicago, Ill., cement block machines.

Cement Age, New York City.

Cement and Engineering News, Chicago, Ill.

Cement Era, Chicago, Ill.

Cement Machinery Co., Jackson, Mich., S. L. Wiltse, brick and block machines.

Cement Tile Machinery Co., Waterloo, Ia., A. E. and F. J. Pfiffner and J. H. Stewart, drain tile machine.

The Century Cement Machinery Co., Rochester, N. Y., whose exhibit was in charge of A. T. Bradley, showed one of the finest collection of blocks in the building and the artistic decorations added much to the beauty of the exhibit.

Chase Foundry and Manufacturing Co., Columbus, O., industrial cars.

Chicago Builders Specialty Co., Chicago, Ill., reinforcement for concrete and concrete mixers.

Chicago Concrete Machinery Co., Chicago, Ill., recently combined with the Indiana Road Machine Co., Ft. Wayne, Ind., A. M. Fitzsimmons, manager, of Chicago office, rotary mixer for concrete.

The exhibit of the Chicago Portland Cement Co., Chicago, Ill., was in charge of W. F. Main, who presented the merits of this excellent cement in a convincing manner.

The Clinton Wire Cloth Co., Clinton, Mass., was represented by Albert Oliver, of New York City, and the employes of the Chicago office, which is at 237 Lake street. In addition to the exhibit of

welded wire cloth reinforcement for concrete, a new method of reinforcement for beams was clearly shown.

W. M. Cokane, Frankfort, Ind., cement finishing tool.

Coltrin Mfg. Co., Jackson, Mich., block machine.

Complete Artificial Stone Co., Chicago, Ill., artificial stone of various kinds and designs.

Concrete, Detroit, Mich.

Concrete Edge Protector Co., Detroit, Mich., E. F. Glock, reinforced concrete curb and gutter.

Concrete Stone and Sand Co., Youngstown, O., A. A. Pauly, steam seasoning car, block machine and wall machine.

P. F. Connelly, Sioux Falls, S. Dak., adjustable cement trowel, edger and jointer, which user can operate in standing position, making faster work and better.

Contractors Supply and Equipment Co., Chicago, Ill., J. M. Trevor, Smith concrete mixers.

A. H. Coombs, Chicago, Ill., model of automatic power block machine.

Diamond Cement Shingle Machine Co., Deshler, O., S. A. Jones, cement shingle machine.

Fred W. Dunn and Co., Chicago, Ill., cement block machine.

W. E. Dunn and Co., Chicago, Ill., cement block and brick machines.

Dykema Co., Grand Rapids, Mich., Frank L. Dykema, brick machine and mixer.

Edmondson Concrete Machinery Co., South Bend, Ind., W. G. Elliott and J. H. Willey, two-piece block machine.

Eureka Machine Co., Jackson, Mich., H. F. Abbott, automatic concrete mixer.

The Expanded Metal and Corrugated Bar Co., St. Louis, Mo., had a very handsome exhibit of electrically lighted transparencies, showing many examples of structures in which their materials and system have been used. The exhibit was in charge of W. C. Berry, of the home office, assisted by Condron and Sinks, the Chicago representatives.

Fisher Hydraulic Stone and Machinery Co., Baltimore, Md., Pres. Fisher and Gen. Mgr. John P. Bullington, hydraulic press block machine.

Garden City Sand Co., Chicago, Ill., supplies, notably the Art Portland Cement Company's Parthenon brand of white Portland cement, Edison Portland cement and waterproofing.

W. Mont Gibbs, Anderson, Ind., cement post fasteners.

Hartwick Machinery Co., Jackson, Mich., proportioning mixers.

Hayden Automatic Block Machine Co., Columbus, O., W. M. Scott, A. P. Kramer, Geo. Fuel, exhibited three of the standard Hayden machines, an excellent concrete mixer for block plants and motor for operating the plant.

Wm. B. Hough Co., Chicago, Ill., concrete mixers, barrows and bars for reinforcing concrete.

Hunkins-Willis Lime and Cement Co., St. Louis, Mo., G. B. Kirwan, supplies and roofing tile.

Ideal Concrete Machinery Co., South Bend, Ind., Wetzstein, Pulfer and Smith, block machines.

International Fence and Fireproofing Company, Columbus, O., R. M. Cunningham and J. M. Campbell, representatives, exhibited the American concrete mixer.

International Harvester Co. of America, Chicago, Ill., gas and gasoline engines.

Ironite Co., Chicago, Ill., J. E. Shakespeare, waterproofing compound.

Knickerbocker Co., Jackson, Mich., concrete mixer.

Arthur Koppel Co., 1637 Monadnock Bldg., Chicago, Ill., exhibited steel dump cars to handle concrete materials and mixers, also their portable track in sections for ready transfer as needed.

The Lehigh Portland Cement Co., Allentown, Pa., was represented by Col. O'Neill and Mr. Swett, and several salesmen who were kept busy distributing handsome souvenirs of the convention in the shape of pencils, pocketbooks and watchfobs.

A. D. MacKay and Co., Chicago, Ill., concrete machinery.

The Marquette Portland Cement Co., Chicago., Ill., was represented by R. B. Dickinson and eight men from the Chicago office. The company has recently issued a very handsome new catalogue which was put into the hands of every one wishing it.

A. C. McClurg and Co., Chicago, books.

Miracle Pressed Stone Co., Minneapolis, Minn., block machines, tampers and other concrete machinery.

Multiplex Concrete Machine Co., Toledo, O., concrete block machine.

Municipal Engineering and Contracting Co., Chicago, Ill., curb concrete mixer.

National Builder, Chicago, Ill.

The National Cement Machine Co., Bay City, Mich., was represented by J. A. McDonald and exhibited its cement block machine, which makes blocks face down and has many points of advantage.

National Concrete Machine Co., Chicago, Ill., cement block machines.

National Concrete Machinery Co., 211 Grand ave., Milwaukee, Wis., post and one and two-piece block machines and mixer.

New Way Motor Co., Lansing Mich., gasoline engines.

The Noble Concrete Machinery Co., Fostoria, O., was represented by J. A. Noble, who was kept busy explaining the special advantages of his honey comb concrete block and the machine for making them.

Non-Staining Cement Co., New York City, Lafarge cement.

North Shore Concrete Co., Rogers Park, Chicago, knee protector for cement finishers.

Northwestern Expanded Metal Co., Chicago, Ill., steel reinforcement.

Northwestern Steel and Iron Co., Eau Claire, Wis., cement machinery.

Peerless Building Block Machinery Co., Milwaukee, Wis., G. H. Gabel.

Peerless Brick Machine Co., Minneapolis, Minn., L. V. Thayer, cement brick machines.

The Perfection Block Machine Co., Minneapolis, Minn., was represented by M. K. Sawyer, the eastern agent, by J. T. Summers and B. C. Dow. They showed the product of their successful power block machine.

The Pettyjohn Bros., Terre Haute, Ind., were represented by L. Pettyjohn, who exhibited to many admiring visitors the good points of their machines.

Popular Block Machine Co., Minneapolis, Minn., A. L. Jones, block machine.

The St. Louis Portland Cement Co. was ably represented by A. Baumberger, of the St. Louis sales offices.

The Sandusky Portland Cement Co., Sandusky, O., was represented by R. R. Fish, who showed not only the staple Medusa brand, but also the interesting waterproofing compound which this company has put on the market and some samples of a new white cement.

R. J. Schwab and Son, Milwaukee, Wis., block machine.

Simplex Manufacturing Co., Jackson, Mich., block and brick machine.

Simpson Cement Mold Co., Columbus,

O., H. G. and B. L. Simpson, molds for concrete work.

R. Z. Snell Machine Co., South Bend, Ind., concrete mixers.

South Bend Machine Co., South Bend, Ind., block and brick machinery.

Standard Concrete Machine Co., Kent, O., mixer.

Standard Stone and Brick Manufacturing Co., Kansas City, Mo., F. S. Phipps, cement stone.

Standard Waterproofing Co., Indianapolis, Ind., G. G. Fry.

Star Cement Block Machine Co., Dallas City, Ill., F. H. Myers, block machine.

Sterling Wheelbarrow Co., Milwaukee, Wis., wheelbarrows.

Stevens Cast Stone Co., Harvey, Ill., sand mold system.

Stumpf and Richards, Milwaukee, Wis., power brick machine.

United States Cement Machine Co., Doshler, O., roofing tile.

The United Cement Machinery Manufacturing Co., which is the combination of the Palmer, Winget and Sanderson interests, was represented by J. F. Angell, and J. W. Sanderson. They had a large exhibit and reported very satisfactory returns.

United States Concrete Machine Co., Detroit, Mich., concrete mixer.

The Universal Portland Cement Co., Chicago and Pittsburg, was ably represented by B. H. Rader and a large corps of salesmen.

Wettlaufer Bros., Buffalo, N. Y., cement brick machine.

White Cement Machinery Co., Jackson, Mich., molds for sills, fence posts, tile, etc.

Whitehall Portland Cement Co., Philadelphia, Pa.

The Williams-Forrest Co., now the Clover Leaf Machine Co., had a very instructive exhibit of their new mixer, which is quite different in form and appearance from any other.

Winner Block Machinery Co., Minneapolis, Minn., block machines.

X. L. Concrete Stone Machine Co., Kansas City, Mo., block machine.

Youngstown Iron and Steel Roofing Co., Youngstown, O., reinforcement.

Report of Committee on Fire Proofing and Insurance.

EDWARD I. CAIRNS, CHAIRMAN, NEW YORK CITY.

The past year has witnessed some interesting progress in the development of fire resistive qualities of concrete. In the hollow block line there have been no actual fires of importance in buildings of this construction, so far as your committee have learned, but several tests have been conducted by various parties, all of which tend to confirm the views expressed in last year's report to the effect that concrete, properly made and applied, is an excellent fire resistive material for certain uses, but has limitations which preclude its being properly classed as absolutely "fireproof." Tests such as have recently been reported in the press by Mr. Sommerville of the Washington building department and others, demonstrate beyond doubt that hollow blocks will surely break apart from unequal expansion of the different sides if subjected to a very serious fire, and, therefore, such blocks are not suitable for "fire walls" or for any part of a building which by reason of its size or contents may develop a fire of high temperature or, particularly, of long duration.

Other experiments involving fire of shorter periods or lower temperatures have not developed this weakness and indicate that under conditions of comparatively mild exposure hollow blocks may be reasonably safe. Just how much fire they will stand in point of temperature and time is yet to be determined, and we anticipate will be ascertained in the tests now in progress by the government laboratory under Mr. Humphrey and the underwriters' laboratories at Chicago. We shall be disappointed if considerable of these data are not produced during the current year.

In the field of reinforced concrete the conflagration at San Francisco furnished numerous examples of very good results in concrete floors. There were thirty-one buildings involved in the fire having more or less concrete, almost all in the shape of floors, of which those of good design and workmanship (according to generally accepted standards) came through with little structural damage. Aside from this San Francisco experience this year has brought little in the way of actual demonstration of fire resistance of reinforced concrete, and anything further on the subject would necessarily be repetition of our report of a year ago.

Insurance companies are still taking an active interest in the investigation of this subject through various committees; they are endeavoring to rate all buildings on their merits and are doubtless progressing as rapidly as the state of the concrete building art will permit. As the use of concrete in all forms increases and experience of engineers and builders improves the quality of work, we believe underwriters will be found ready and anxious to recognize liberally all the progress shown, though for the present it is only reasonable that they should be conservative in their ratings on account of the defects in design, material and workmanship which have been so common in the art up to this time.

We would again suggest the importance of members reporting to this committee all cases of fires in buildings of concrete construction of any type. This field experience is most valuable in solving the various questions involved in fireproof qualities of concrete and we respectfully urge that all members bear this committee's work in mind and see that full details of fires are reported.

Forms for Concrete Construction.

BY SANFORD E. THOMPSON, M. AM. SOC. C. E., NEWTON HIGHLANDS, MASS.

Recent failures in reinforced concrete construction can not be cast to one side and forgotten with the passing comment so frequently heard that the accident was due merely to poor construction or too early removal of forms. The reasons for every failure should be thoroughly investigated by experts to prevent recurrence of similar accidents.

"Poor construction" and "forms," although frequently guilty, are by no means the only culprits. Just as long as men who know nothing of the first principles of mechanics are permitted to design concrete structures, and just so long as irresponsible contractors are engaged to erect them, the list of accidents will increase in startling numbers. It is the men, not the inanimate lumber, who are to blame in every case. However, granting its danger under ignorant hands, reinforced concrete as a whole must not be condemned for failure due to improper conditions any more than brick should be rejected as a building material for apartment houses because of the collapse of several unfinished buildings in New York City two years ago through disregard of frost action upon the mortar.

Failures in concrete buildings may be attributed to:

(1) Imperfect design, especially through neglect of essential details in locating the reinforced metal, and through the adoption of too low a factor of safety.

(2) Poor materials, such as cement which does not properly set up, or sand which is too fine or which has an excess of clay, loam or other impurities.

(3) Faulty construction, from improper proportioning, mixing or placing, or too early removal of forms.

(4) Weak forms.

A disregard of such important principles is frequently criminal negligence, and yet in at least one case under my observation, an examination of the structure and the materials after a collapse in which a number of lives were lost showed both the design materials and construction so faulty that it was impossible to decide positively which of the four causes named above was the primary reason for the failure.

In this paper it is proposed to treat only of the design, construction and removal of forms.

General Rules for Form Construction—Kind of Lumber. The selection of the lumber must be governed by the character of the work and the local market. White pine is best for fine facework, and quite essential for ornamental construction cast in wooden forms. For ordinary work, however, even for the panels, white pine is apt to be too expensive, and spruce fir, Norway pine or the softer qualities of Southern pine, especially North Carolina pine, must be substituted for it. Some of these woods are more liable to warp than white pine, but they are generally stiffer and thus better adapted for struts and braces.

Kiln-dried lumber is not suitable for form construction because of its tendency to swell when the wet concrete touches it. Very green lumber, on the other hand, especially Southern pine, which does not close up quickly when wet, may give trouble by joints opening. Therefore the middle ground, or in other words, partially dry stuff is usually best.

Finish and Thickness of Lumber. Either tongued-and-grooved or bevel edged stuff will give good results for floor and wall panel forms, and is preferable to square edged stuff. A smoother surface may be attained at first with the tongued-and-grooved stock and there is less trouble with opening joints, but it is more expensive because of the waste in dressing, and if the forms are used many times there is greater tendency to wear at the joints. Even for rough forms plank planed one side may be economical to cheapen the cost of cleaning. Studs should always be planed one side to bring to size.

The thickness of lumber varies with different contractors, some using 1-inch, others 1½-inch, while a few employ 2-inch stuff even for panels. (These are commercial thicknesses measured before planing.) For ordinary walls 1½-inch stuff is good, although for heavy construction where derricks are used 2-inch is preferable. For floor panels 1-inch boards are most common, although if the building is eight stories high or over, 1-inch stuff is likely to be pretty well worn out before the top of the building is reached, and the under surface of the concrete will show the wear badly. For sides of girders either 1-inch or 1½-inch is sufficient, while 2-inch is preferable for the bottoms of girders. Column forms are generally made of 2-inch plank.

Details of Form Construction. Certain general rules are applicable to all kinds of forms. Strength, simplicity and symmetry are three fundamental principles of design. The necessity for strength is obvious. Economy in concrete construction consists in quickly erecting and moving the forms and in using them over and over again.

The design of the concrete members should recognize the forms. A slight excess of concrete sometimes may be contributed to save carpenter work. Fre-

quently beams may be designed of such widths as to use dimension sizes of lumber without splitting.

Columns may be of dimensions to avoid frequent re-making. Recesses may be made the thickness of a board or a plank. To permit ready cleaning of dirt and chips from the column forms before laying the concrete, at least one prominent contractor provides a door at the bottom of each of them.

In building construction the forms must be designed so that the column forms and also the bottom of beam molds are all independent of the slabs. The forms may thus be left a longer time upon members subjected to the greater stress.

The sides of the beam forms should be held tightly together by wedges or clamps to prevent the pressure of the concrete springing them away from the bottom boards. Hard wood wedges at top or bottom of each strut are useful when setting and removing it and also permit testing to make sure that there is no deflection of the beam or slab. For this purpose some contractors loosen the wedges twenty-four hours in advance of the struts. In general it is preferable to use comparatively light joists, such as 2-inch by 8-inch or 2-inch by 10-inch, with frequent shores rather than to use lumber which is heavier to handle.

If forms are to be used but once or must be taken apart when removed, it is sometimes practicable to use only a few partially driven nails so that they can be withdrawn without injury to the lumber. It is very difficult to convince house carpenters that the pressure of the concrete will hold temporary panel boards in place with scarcely any nailing.

Alignment is another item of importance, since it is here that a great deal of time may be wasted by inexperienced or incompetent carpenters. Such workmen may err either on the side of poor alignment or more careful alignment than the structure requires. Mr. W. J. Douglas suggests as a general rule the allowance of "⅜-inch departure from established lines on finished work and 2 inches on unfinished work."

In removing forms the green concrete must not be disturbed by prying against it. This seems to be so obvious as to need no emphasis, but I have known first-class carpenters to actually attempt to straighten a wall which was an inch out of line the day after the concrete was laid by prying the forms over. The wall was straightened, but by a different process from that proposed by the carpenter: the concrete was relaid.

Forms for facework should be tightly put together, it being advisable in some cases to close the joints and holes by mortar, putty, plaster of Paris, sheathing paper or thin metal. This is not, as is commonly supposed, to prevent loss of strength by the cement which flows out with the water, but rather to prevent the formation of voids or stone pockets in the finished surface.

Crude oil is one of the best materials to prevent adhesion of the concrete to the forms, though linseed oil, soft soap and various other greasy substances are also employed for this purpose. The oil or grease should be thin enough to flow and fill the grain of the wood.

If the forms are to be left on until the concrete is hard, there is little danger of the concrete sticking to them if they are wet thoroughly with water before the concrete is laid, instead of being greased. In any case, if concrete adheres to the forms it should be thoroughly cleaned off before resetting; even then it is apt to stick again in the same place.

Design of Forms. "Rule of thumb" layout of forms in the field is being superseded by design in the drawing room. In building construction where the forms form a large percentage of the cost of the building and where a failure in the forms may cause loss of life, it is especially necessary to treat this question from an engineering standpoint, and many of the best concrete contractors now design their forms as carefully as the dimensions of the concrete members.

If a minimum quantity of lumber is to be used consistent with the deformation allowed, it follows that the dimensions and spacing of the supporting lumber must be actually computed from the weight or pressure against the sheathing. For columns and for walls where a considerable height of wet concrete is to be placed at once the pressure may be calculated as a liquid. Mr. W. J. Douglas assumes that the concrete is a liquid of half its own weight or 75 pounds per cubic foot.

In ordinary walls where the concrete is placed in layers, computation is not usually necessary, since general experience has shown that maximum spacing for 1-inch boards is 2 feet, for 1½-inch plank is 4 feet, and for 2-inch plank is 5 feet. Studding generally varies from 2 by 4 inch to 4 by 6 inch, according to the character of the work and the distance between the horizontal braces or waling.

Floor forms are better based upon an allowable deflection than upon strength, in order to give sufficient stiffness to prevent partial rupture of the concrete or sagging beams.

In calculating we must add to the weight of the concrete itself, i. e., to the dead load, a construction live load which

may be assumed as liable to come upon the concrete while setting. Definite units of stress must also be assumed in the lumber.

I would suggest the following basis for computation, these being values which I have adopted after quite thorough consideration of the matter:

(1) Weight of concrete, including reinforcement, 154 pounds per cubic foot.

(2) Live load, 75 pounds per square foot upon slab; 50 pounds per square foot in figuring beam and girder forms.

(3) For allowable compression in struts use 600 to 1,200 pounds per square inch, varying with the ratio of the size of the strut to its length. (See table below.) If timber beams are calculated for strength, use 750 pounds per square inch extreme transverse fiber stress.

(4) Compute plank joists and timber beams by the following formula, allowing a maximum deflection of one-eighth inch:

$$d = \frac{3}{384} \frac{W. l^3}{E I} \qquad (1)$$

$$\text{and} \quad I = \frac{bh^3}{12} \qquad (2)$$

in which

d equals deflection in inches.

w equals load on plank or joist.

l equals distance between supports in inches.

E equals modulus of elasticity in lumber used.

I equals moment of inertia of cross-section of plank or joist.

b equals breadth of lumber.

h equals depth of lumber.

The formula is the ordinary formula for calculating deflection except that the coefficient is taken as an approximate mean between 1-384 for a beam with fixed ends and 5-384 for a beam with ends simply supported.

For spruce lumber and other woods commonly used in form construction, E may be assumed as 1,300,000 pounds per square inch.

Formula (1) may be solved for I, from which the size of joist required may be readily estimated.

The weight of concrete per cubic foot is somewhat higher than is frequently used, but is none too much where a dense mixture and an ordinary percentage of steel is used. For very rough calculation, however, it is frequently convenient to remember that 144 pounds per cubic foot is equivalent to the product of the dimensions of a beam in inches times a length of one foot.

The suggested live load is assumed to include the weight of men and barrows filled with concrete and structural material which may be piled upon the floor, not including, however, the weight of piles of cement or sand or stone, which should never be allowed upon a floor unless it is supported by concrete sufficiently strong to bear the weight or by struts under all the floors below.

The units for stress in struts are somewhat higher than in timber construction because the load is a temporary one. The extreme variation given is due to the fact that when a column or strut is longer than about sixteen times its smallest width, there is a tendency to bend, which must be prevented either by bracing it both ways or allowing a smaller load per square inch. For struts ordinarily used the following stresses may be assumed for different heights:

SAFE STRENGTH OF WOOD STRUTS IN FORMS FOR FLOOR CONSTRUCTION.

Pounds per Square Inch of Cross-Section.

Length of strut ft.	Dimensions of Strut.			
	3in.x4in.	4in.x4in.	6in.x6in.	8in.x8in.
14		700	900	1100
12	600	800	1000	1200
10	700	900	1100	1200
8	850	1050	1200	1200
6	1000	1200	1200	1200

Bracing both ways will, of course, reduce the length of a long strut.

If the concrete floor is comparatively green, the load must be distributed by blocking, preferably of hard wood. At the top of the strut provision must be made against crushing of the wood of the plank or crosspiece. Ordinary soft wood will stand without crushing only about 700 pounds per square inch across the grain, so if the compression approaches this figure, brackets must be inserted or hard-wood cleats used.

Time to Move After Placing. The best contractors have definite rules for the minimum time which the forms must be left in ordinary weather, and then these times are lengthened for changes in conditions, according to the judgment of the foreman.

Correspondence with a number of prominent contractors in various parts of the country, including the Aberthaw Construction Company (Boston), the Expanded Metal and Corrugated Bar Company (St. Louis), the Ferro Concrete Construction Company (Cincinnati), the Trussed Concrete Steel Company (Detroit), and the Turner Construction Company (New York), indicate substantial agreement in the minimum time to leave forms. As a guide to practice, the following rules are suggested, these following in the main the requirements of the Aberthaw Construction Company:

Walls in mass work: One to three days, or until the concrete will bear

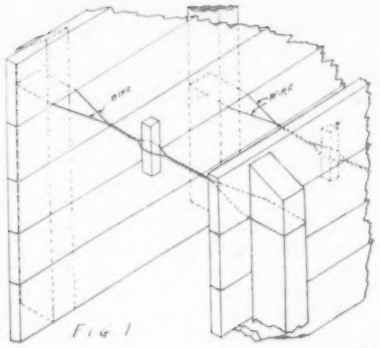


Fig 1

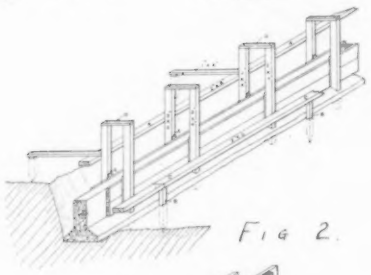


Fig 2.

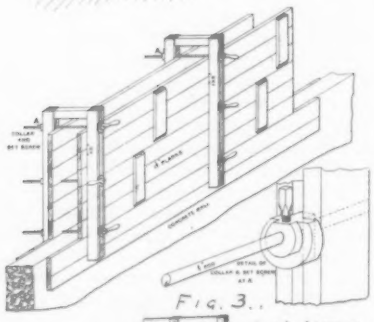


Fig. 3.

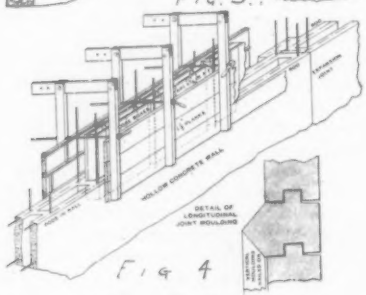


Fig 4

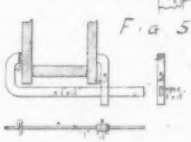


Fig 5.

FORMS FOR CONCRETE CONSTRUCTION.

Reproduced by permission from Taylor and Thompson's "Concrete, Plain and Reinforced."

pressure of the thumb without indentation.

Thin walls: In summer, two days; in cold weather, five days.

Slabs up to 6 feet span: In summer, six days; in cold weather, two weeks.

Beams and girders and long span slabs: In summer, ten days or two weeks; in cold weather, three weeks to one month. If shores are left without disturbing them, the time of removal of the sheeting in summer may be reduced to one week.

Column forms: In summer, two days; in cold weather, four days, provided girders are shored to prevent appreciable weight reaching columns.

Conduits: Two or three days, provided there is not a heavy fill upon them.

Arches: Of small size, one week; for large arches with heavy dead load, one month.

All of these times are, of course, simply approximate, the exact time varying with the temperature and moisture of the air, and the character of the construction. Even in summer during a damp, cloudy period, wall forms sometimes can not be removed inside of five days with other members in proportion. Occasionally, too, batches of concrete will set abnormally slow either because of slow setting cement or impurities in the sand, and the foreman and inspector must watch very carefully to see that the forms are not removed too soon. Trial with a pick may assist in reaching a decision.

Beams and arches of long span must be supported for a longer time than short spans, because the dead load is proportionately large, and therefore the compression in the concrete is large even before the live load comes upon it.

The general uncertainty and the personal element which enters into this item emphasize the necessity for some more definite plan for insuring safety. The suggestion has been made that two or three times a day a sample of concrete be taken from the mixer and allowed to set on the ground under the same conditions as the construction until the date when the forms should be moved. These sample specimens may be then put in a testing machine to determine whether the actual strength of the concrete is sufficient to carry the dead and construction loads. Even this plan does not provide for the possibility of an occasional poor batch of concrete, so that watchfulness and good judgment must also be exercised.

Examples of Form Design.—The author gave a number of illustrations of typical modern form construction, part of which are herewith reproduced.

Fig. 1 illustrates the construction of a heavy wall where the ties consist of wire twisted to hold the sides in place.

A simple form of construction for a low foundation wall is given in Fig. 2.

Fig. 3 illustrates a common form for building a wall of greater height. As soon as a section is completed, the bolts are loosened, and the slotted form of clamp or brace permits it to be readily moved upward. This slotted construction was designed by Mr. E. L. Ransome, one of our pioneers in concrete construction.

Forms for hollow walls are shown in Fig. 4.

A clamp which is much used by the Ferro-Concrete Construction company of Cincinnati is shown in Fig. 5.

A somwhat different type of beam and slab forms has been designed by Mr. Benjamin Fox. The forms for each panel are made in two sections and supported at the center so that they may be dropped without disturbing the bottom plank of the beams and girders. The beams and girders are stiffened by 6x8-inch and 8x8-inch timbers, placed underneath them and supported by posts varying in size from 4x4-inch to 8x8-inch, according to the load to be carried.

Art and Architecture in Concrete Structures.

BY CHAS. D. WATSON, GENERAL MANAGER, THE ROMAN STONE COMPANY, LTD., TORONTO, ONT.

The necessity for further study and experiment to make concrete adaptable for use in the higher grades of work where artistic effect is required is beginning to be realized, and urgent demands for improvement are being made by the technical press. As one editor says, he reveals no secret when he states that "A good looking concrete bridge or building is an exception." It is just as important that methods be devised for improving the appearance of concrete as it is to devise methods by which we can eliminate defects in structural design and execution of the work, a subject much discussed at the present time.

It is necessary, in reviewing the progress made, to discuss separately the three different classes of concrete work:

Monolithic concrete.
Cement block buildings.
Manufactured stone.

The views of those engaged in these three different lines of work vary considerably, as regards the treatment of the material. The monolithic man insists that cement should not be used in imitation of stone. The manufacturer of cast stone insists that his product is as true a stone as any natural rock quarried, and therefore can not legitimately be treated in any way except as stone, while the manufacturer of cement building blocks is divided between the two, depending upon the class of work he is doing. Without doubt the views of the monolithic man and the manufactured stone man are both right. The treatment of concrete depends largely upon the kind of concrete. It has not been long that architects and engineers recognized that there was more than one grade of concrete. The mixture of cement with any kind of aggregate in certain proportions, with little reference to size and character, was apparently all that was expected. With the introduction of concrete for super-structure work, the necessity of more scientific methods has been forced upon us, with the result that we have practically reversed some of the original theories, such as the amount of moisture required, and the necessity of more careful selection of aggregates. The most difficult problem that confronts those interested in the improvement of the appearance of concrete is in monolithic construction, such as bridges, retaining walls, and heavier classes of masonry. Improvement in this class of work is necessarily of the greatest importance, as the bulk of concrete work is of this nature. Of the various methods applied to date, that of tooling, either by hand, or by pneumatic tools, seems to be the best. The older methods employed, such as plastering and washing, have, as a general rule, not proven very successful, at least in America, but it would appear that this condition is due more to lack of experience in application than to the method.

There has lately been introduced, and from reports quite successfully, a method of washing the concrete while green, in this way removing the cement and sand and exposing the coarser aggregate of the concrete. Some notable work along these lines has been done by Mr. Henry H. Quimby, and the Chicago Park Board, under the direction of Mr. White.

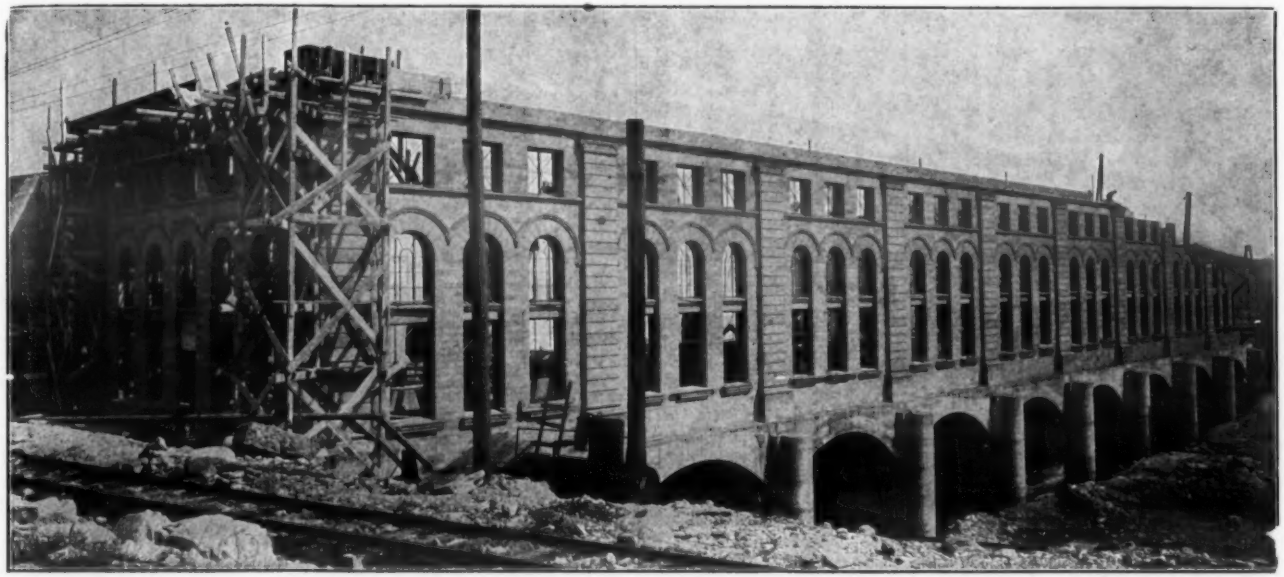
The principal difficulty in employing this method in actual practice is the necessity of removing the forms to enable the concrete to be washed while it is still in a green, or comparatively soft condition. There is a large field for further experiment in this branch of the work. The necessity for overcoming the dead and monotonous gray color of cement is what appears most important. The variety of results to be obtained by the use of various colored aggregates offers a large field for experiment, but whatever the method, it is apparent that it must be based upon some plan to remove the coating of cement which surrounds the aggregate, and gives the mass of concrete its color, whether it is done by dressing or by washing.

In the field of cement block construc-

tion, the progress during the past year has been most noted for the improvements which have been adopted in the designs of the face of the blocks. It would appear that cement block manufacturers had originally in some way conceived the idea that the only successful way to make a block was to imitate the rock, or quarry faced natural stone. They seemed to have lost sight of the fact that structures built of rock faced natural stone in which each stone was the same size and color throughout the building would be as equally inartistic as the rock faced hollow block. An artistic rock faced natural stone building depends upon having the proper amount of irregularity in the size and bond of the stones. Block manufacturers who still adhere to the rock faced design seem to be appreciating this fact, and are adopting means by which they are able to vary the size of the block, and the results are showing a decided improvement in the appearance of their structures. It is a question whether, from an architectural stand-point, concrete blocks should be made of this pattern at all. It is impossible to imitate the quarried face of natural stone, and it is doubtful if any architect would allow such a finish in natural stone above the water table if it were not for the fact of its economy. The smooth, or tooled finish, inasmuch as it is artificially produced in cut stone. is probably the best model for the cement block manufacturer. Of course, the block manufacturer recognizes that in the rock faced design the requirements and execution of the work, such as the keeping of straight arisses and uniform joints are not so important, but it is improvement in the grade of the work, and not means of hiding the defects that the architects are demanding. The greatest difficulty in cement block manufacture, as well as in monolithic concrete construction is in overcoming the natural color of the cement. It seems that the mixture of various colored pigments has not thus far solved the difficulty.

CARSON, NEV., HIGH SCHOOL.
Built of Ferguson Two-Piece Blocks.

From present appearances it would appear that the solution of this vexatious problem in concrete construction is going to come from the use of a manufactured stone for the facing of the structure in the higher grades of architectural work. Most writers, in discussing the means of improving the architectural appearance of such structures, seem to forget that the first necessity in appearance is in having the concrete of the proper density, and made from such an aggregate that the finish once given shall remain permanent. In monolithic construction it is impracticable, if not impossible, to put in concrete for the surface which is of the proper grade to allow of a satis-



POWER HOUSE OF CHICAGO DRAINAGE CANAL.
Ferguson Two-Piece Blocks.

factory finish. In cement building blocks where the concrete is mixed comparatively dry, it is beyond a doubt a physical impossibility to make a concrete dense enough to resist the discoloration brought about by absorption.

With factory-made stone on a process which allows the use of a proper amount of moisture, where the aggregate can be carefully selected and proportioned, where the casts can be seasoned and finished, and the whole work performed by scientific methods under systematic and expert supervision, it is possible to make a concrete whose absorption is less than most of the common building stones, and whose texture is such that it can be finished in the many various ways in which natural stone is finished, giving without a doubt a material equal to natural stone in appearance, much more durable, and considerably cheaper. Of course, it must be recognized that a high grade of manufactured stone of this nature is necessarily more expensive than monolithic concrete or machine-made blocks, but with the labor saving devices now being introduced for the manufacture, handling and finishing, there is every indication that in manufactured stone lies the greatest hope of a solution. Attendant with the advance of concrete for structural users are enormous possibilities for the use of manufactured stone. Heretofore manufacturers were compelled to make stone of the sizes of the natural stone of which their product took the place, but with reinforced concrete, the stone facing can be reduced to an exceptionally thin veneer, which in many cases can be used in place of forms, thus effecting a large saving in the cost of this class of structure, and setting all question of the external appearance of the structure.

Concrete Blocks.

BY HARMON H. RICE, DENVER, COL.

Because I believe that concrete block construction presents a representative style of architecture, typical of that spirit of independent enterprise characteristic of American progress, and because Europe, Asia, Africa and the Islands of the Sea are looking to the States for light upon this industry, I characterize the conduct of our business, or if you please, the practices of our profession, as the National Game, believing that in the play of the diamond we shall find an interesting and instructive parallel to the opportunities and responsibilities of coworkers in the domain of concrete blocks.

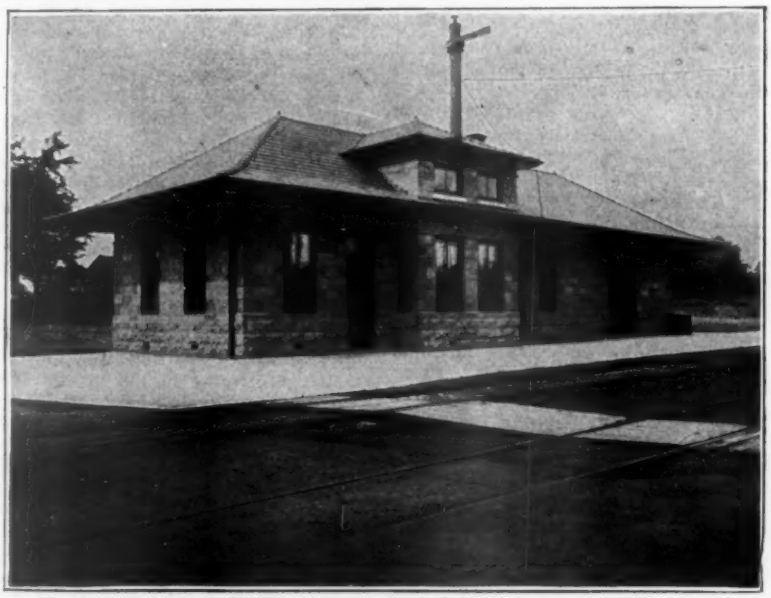
In the pitcher's box stands the stalwart block-maker, in stature well proportioned, by nature a good mixer, through systematic training always in good form. There are too many smart men, and too few able men, filling this position. The time has passed when the pitcher may, with clever curves, deceive the watchful batter's eye. The battery of wood, clay and stone has learned to know these curves. The victory of the day is to him who, with perfect mastery of self and with thorough knowledge of the field, delivers a ball which is strong, swift and true—a thing of beauty and a winner forever. In the throwing of such a ball there is successful introduction, there is permanent and increasing patronage, there is profit, and there is public favor. Uniform excellence rather than spasmodic brilliancy counts on the score card.

The superintendent takes the catcher's place, because from this position the personal equation can never be eliminated. Whatever may, with truth, be said for the efficacy of modern appliances adopted to playing the game, however completely the catcher may be equipped with mask, mitt and shield, it is in the end the man behind the bat who saves the day. It is his quick eye, supported by a studied knowledge of the field, an intimate acquaintance with the players, and an intuitive recognition of the vulnerable points of the opposition, which brings his adversaries to shame. It is he who must watch the field and the bases, to the end that he may ever support the play and cooperate with the plans of the several players.

The machine manufacturer we put on first base, because in those olden days when we "chose up sides," he who came first usually claimed this position. So, by precedence in the field, it goes to the maker of machines. When he first took the place he had not that full quota of players which we find to-day. He had some sorry days before the game was popularized. But he was a persistent player. And then there came a time when some of those on the bleachers said that the first baseman drew higher pay than the pitcher, but that day too has passed, for the game draws greater crowds and the pitcher's skill is cheered by audiences who have learned to know its merits and to watch the ball. And yet does not our first baseman rest too easily upon his laurels; does he not rely too much on the pitcher's skill and the catcher's diligence to increase the interest of the game? Rank imposes obligation, and our first baseman may not shirk the responsibilities incident to his birthright.

On second base we have the cement manufacturer. He plays well, though at times lacking enthusiasm. But he has many rival interests, with his golf and his cricket and other games which he

ORNAMENTAL CEMENT BLOCKS FOR POWER HOUSE OF CHICAGO DRAINAGE CANAL.



WABASH RAILWAY STATION, MEXICO, MO.
Ferguson Two-Piece Blocks.

learned in the land of his birth. And yet he is, withal, a dependable player, a player of quality, a player who always stands the test. In the changes of climate incident to the migration of the club, in freezing and in boiling weather, his tenacious qualities prevent its disintegration. His strength is so great that he does not become distorted, even when the umpire's words are thrown at him. In emotion he is paradoxical, inasmuch as his heart-strings have been torn asunder by one-tenth the grief necessary to crush him.

The mason is on third base, where careful, accurate uniformly excellent work is required. Too often a wild throw from third enabled the runner to land safe on the home plate. Perhaps it is not too much to say that the slovenly mason's work on third base has lost more games than the careless work of any other single player. He has regarded our national game with less favor than those games handed down to the present generation from the ancients of Egypt and Assyria. His longer training in the games of the Orient has made his hand cunning to their play, and he has imagined that in seeking their perpetuity he was ensuring more continuous acticity for himself.

Our salesman short-stop is so optimistic concerning the ultimate success of the game that many regard him as visionary. And yet to him is due the credit of earnest and persistent work toward the realization of his visions. He has gone into waste places to introduce the game, by his intimate knowledge of its rules he has taught others to play without error. By his energy and fair dealing he has gained the respect of the opposition, while his good counsel has enabled his colleagues to make plays of such unexpected quality that the grand stand rocks with applause. In his success there are no secrets save honest, loyal and untiring zeal. He has studied the game well, he knows the men, he keeps his eye on the ball, and he enjoys the confidence of his fellow-players, of his opponents and of his umpire.

The architect is in the left field, and it is only when the pitcher throws carelessly or a mighty man comes to bat that the ball reaches him. Hence he has much time to watch the exertion of other players, and he seems to be growing a bit restless and anxious to come closer in the game. Time was not long ago when he refused to play, but as he sat on the bleachers and fanned himself with his hat he could but observe the intrinsic interest of the game and the ever increasing skill of its players. He is now one of us. Let us welcome him, and applaud heartily when he plays well.

The contractor in right field takes an exceedingly practical view of our game. To the vox populi his ear is ever open. He is a good player, but ready to stay with us or to leave us as the crowd may applaud or deride. So he keeps one eye on the grand stand, and if handkerchiefs be waved and hats flung high, his energies rise to mighty plays. With the increasing popularity of the game, it is hoped that he will become more settled in his appreciation of its merit.

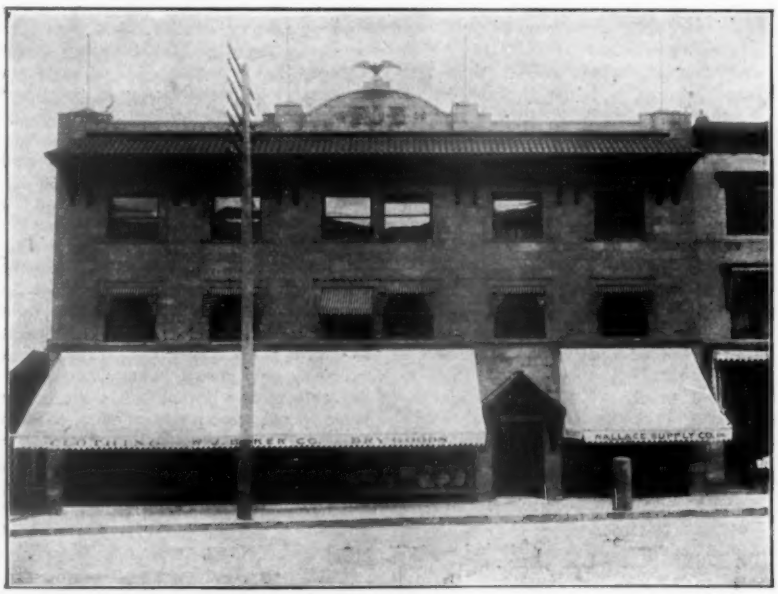
To our good friend, the journalist, we give center field, and in it he does valiant work. The shouts and plaudits of the throng are dear to him, and he adds greatly to the joy of all by those spectacular plays which wring enconiums from the very boards on which spectators sit. He may not know all about the game, but he is powerful in talk, and he keeps up our spirits on days when things go badly. It is his wide reputation which has added so largely to the gate receipts and sometimes, when crowds are not what they should be, the captain excuses him for the afternoon to go down among the newspaper offices and fill the galleys with the history of past triumphs, the story of our present greatness, and the prophecy of our future magnificence.

The owner of the building into which concrete blocks shall go is our umpire. To win from him the coveted decision it is not enough that one should play well—he must play at his best. The umpire knows the game better than do some of its players. To attempt deception is to invite his displeasure. Honest, manly, fair play counts with him. He does not greatly mind the so-called brilliant plays. The player who wins his enduring approval is that one who is ever in form, who day in and day out strictly observes the rules of the game, who avoids errors as a plague, and who invariably plays a good game.

If we are in the game, let us play it as well as we are able. Let each man, while performing to the utmost limit of his ability, the duties of his particular position, never fail to render with heart and hand that support to his fellow-players without which the game can not be a success. In community of interest, and unity of endeavor, lies the ultimate success of the nine.

In any discusion of concrete block construction, the basis of consideration is form. As to the importance of form, I am indebted to Mr. George Iles for a most forceful illustration. In his new book, "Inventors at Work," he tells of an experiment made in Canada during very severe winter weather. A piece of ice

RESIDENCE OF J. A. FERGUSON, DENVER, COL.
Faced with one-quarter inch of Portland Cement. No cracks after nine years.



EAGLES' BUILDING, WALLACE, IDA.
Ferguson Two-Piece Blocks.

was fashioned to the form of a lens, and so effectually did it focus the sun's rays that paper was burned and wood was charred in the same manner as though an ordinary reading glass had been used. Thus is shown the paramount importance of adapting the form of structural material to the service required.

The plasticity of concrete enables it to be molded into units of greater utility than those of any other building material known to mankind. Without attempting to speak of the many forms on the market to-day, it may be said in respect to all that the air space in the wall gives to block construction its distinctive advantages. Too readily do we allow minor considerations to rob us of an adequate air space, and too careless are we of the encroachments of those building departments which reduce it to a point which strips the concrete block of its essential points of superiority. There is, I hold, no excuse for making blocks of so inferior quality that the percentage of air space need fall below that requisite to the preservation of fire-proof, frost-proof, moisture-proof, heat-retaining and heat-resisting walls.

But to maintain this high standard of quality the ingredients must be right, and they must be used in such relative proportions that voids will be eliminated, and maximum strength and density will result. It is application of scientific principles of concrete work, rather than the haphazard use of a large proportion of cement, that makes for quality.

The thorough manipulation of the mass is more essential in block manufacture than in any other branch of concrete engineering. Where defective blocks have been produced, investigation has generally disclosed faulty mixing. Hand mixing is seldom sufficiently thorough, while operators in the smaller towns have been unable to bear the expense of installing and operating power machines of standard type. The present season, however, brings to the relief of such operators a unique hand mixer of adequate capacity which mixes thoroughly, and leaves no excuse for clinging to the shovel and hoe of former days.

Of curing, I would that the time permitted me to speak exhaustively. Herein lies success. Drying is not curing. Ageing is not curing. Curing is a scientific process by which a plastic body of concrete is converted into an enduring stone-like unit able to honorably bear the duty for which it is designed.

It is not in a spirit of criticism that I advocate the application to concrete block manufacturer of scientific principles of concrete engineering. Rather is it because I thoroughly believe in the ultimate ascendancy of this type of building, and because a duty is upon us to urge universal maintenance of the highest standard of quality in what will to-morrow be known as the great American industry. Great because it reaches the very heart of our people in the construction of strong, durable, comfortable and sightly homes at moderate cost. Great because it reaches from the metropolis to the most remote hamlet of the nation. Great because it affords that opportunity, which without it is withheld, of building enduring habitations in the desert, warm abodes in the north, cool houses in the south, dry houses in the valley by the great river, fire-proof homes beyond the highways of hose carts.

I know full well that I have but touched the edge of that fertile field wherein the uses of concrete blocks are ripening for the harvest. I know full well of their efficacy in the ornate palaces of the rich, and in the imposing edifices of county and of State. And yet it seems to me when the end is told it will be known that concrete block construction finds its ideal application in the homes of Americans, and that in those homes it will find an ultimate glory over which the lofty scraper of the sky may cast no dimming shadow.

If we go not hence with a fuller appreciation of the dignity of our calling, with a firmer regard for the merits of our merchandise, and with a firmer resolution to lift the concrete block industry to that high place of public favor to which it is rightly entitled, our meetings together shall have been of no avail.

"Not how cheap, but how good, can concrete blocks be made," is the battle-cry with which the ranks of this Association must resound as we go from this convention hall to wage ceaseless warfare in a campaign which shall devastate the enemy's land, but shall beautify, and enrich, and build up the country through which we march to victory.

ROADS AND BRIDGES

Bridge Trust Investigation—Post Office and Good Roads—Chicago Paving along Parks—Montana Highway Commission—Choice of Pavement after Bids—Minneapolis Public Improvements—Tar on New York Highways—Michigan State Roads—Italian Paving—Park Interest.

Bridge Trust Investigation in Illinois.

An investigation of the alleged bridge trust has been commenced by the supervisors of Whiteside, Ogle, Lee, Stephenson, Carroll and Jo Daviess counties, Illinois, and three supervisors from each of the counties will meet February 6 to push the probe. It is alleged that the bridge trust controls the price of the construction of bridges in the six counties, that profits are divided with other companies, and in this manner the prices are made high and the taxpayers are compelled to pay the bills. The state will assist in the prosecution, according to local press reports.

The Post Office Department and Good Roads.

Most satisfactory results have been realized in the co-operation of the Post Office Department with state road officials throughout the country, with a view to the improvement of public highways on which rural routes are in operation. Assistant Postmaster General De Graw states that "where co-operation is had with the department road conditions have very noticeably improved, and many instances are noted, in states having no state road organization and where road funds are lacking, where patrons were so appreciative of the benefits derived from the rural delivery service, of which they did not wish to be deprived, that they had provided the necessary funds to repair roads and bridges by private subscriptions or themselves furnished the necessary labor and material." He says he finds the road question very difficult of solution in many sections of the country where stone and other road-building materials are not available, but that much good has been and could be accomplished in these sections through the use of road drags and proper drainage.

The Post Office Department is anxious to co-operate with all state road officials and, as the maintenance of efficient service on the rural routes with a close observance to schedule depends upon the condition in which the roads are kept, it is of the greatest importance that postmasters and rural carriers lend their active aid and co-operate in the general work of road improvement to both state and local road officials.

Paving Chicago Streets Surrounding Parks.

A joint resolution is being prepared by Senator Juul of Chicago, providing for the appointment of a committee of five members from both houses, five from the Chicago city council and five from each of the park boards to devise a plan whereby the streets surrounding the different parks may be paved. The idea is to overcome the difficulties created by the supreme ocurt decision holding that park boards could not be assessed for street paving inasmuch as their expenditures must be limited to the establishment and maintenance of parks.

Highway Commission Proposed for Montana.

Literature is being circulated over the state of Montana by Professor E. Tappan Tannatt, of the civil engineering department of the Montana State Agricultural College in furtherance of a new law which he hopes to have enacted by the legislature. The proposed law provides for the establishment of a highway commission after the plan of the one in Iowa. This commission will include three road experts, two of whom are to be from the engineering departments of the State Agricultural College. The third will be a traveling expert who will give his whole time to the work. The duties of the commissioners are to be advisory and supervisory, rather than administrative. They will be prepared to make a study of any locality and give advice regarding the construction of roads, bridges, culverts, drainage systems, etc.

Choice of Pavement After Bids Proposed for Indiana.

An amendment to that part of the cities and towns act applying to street

improvements in cities to which the Barrett law applies will be asked of the Indiana legislature by mayors of cities affected. The amendment would make it possible for the board of public works to adopt specifications for a street improvement under which it could call for bids on two or more kinds of pavements, the kind to be used to be determined after bids have been opened and compared. As the law is now, bids may be asked on only one kind of pavement. This is decided upon by the board of works, but under the law the board is bound in its selection by the will of a majority of the resident property owners. The board can not order a different kind of pavement than that favored by a majority of the resident property owners, without sending the matter to the city council and getting that body's approval of its choice by a two-thirds vote. Under the proposed new law, the procedure would be to have the board decide that some pavement shall be laid and when remonstrances have been heard ask for bids on two or more kinds of pavement. For instance, when bids had been received on brick, asphalt, wooden blocks and bituminous macadam, the affected property owners could then signify their choice of all the bids submitted and the board in its award of the contract would be governed by the will of the majority of the property owners.

Tar on New York State Highways.

In order to prevent the dust from gathering on the various macadam roads, State Engineer Van Alstyne has been experimenting with a mixture of tar, which has proved very successful. The experiment has been made on the Loudonville Road from the schoolhouse to the Menands Road. Automobilists and residents along the road are enthusiastic over the result.

In the past different materials other than water have been sprinkled on the road surface, such as oils and petroleum or water containing soluble salts, but none of these methods have been successful. The oil dust which arose proved very irritating to the eyes and nose. As the oil settled in the depressions of the road and made these more impervious to water, puddles remained at these places for some time after rains, with the result that these soft spots were cut into by the wheels and the depressions soon became holes.

Many experiments have been made on methods of suppressing dust on unpaved roads, but the most satisfactory results have been obtained by the use of tar, which, when melted and sprinkled upon the road surface and properly worked in with brushes, will penetrate to a considerable depth. In this country very few experiments of this kind have been made. However, the experiments made on the Loudonville Road with tar have given excellent results. The material is called tarvia for road surfacing.

It is simply a fluid tar about the consistency of molasses when cold and as fluid as water when heated, which has been treated by boiling so that practically all the water has been driven off, leaving a very uniform mixture. Ordinary coal tar contains from 3 to 30 per cent of water. This is not a uniform product, and it is somewhat dangerous to heat it over open fires, as the water causes the material to foam and very often boil over, and as it is extremely inflammable, the danger of fire is very great. Tarvia is never used for the under portions of roadbeds and is in no way a pavement.

This particular piece of road, known as the Loudonville Road No. 22, was selected by the state engineer, as it was through a thickly populated village and the dust was very annoying.

This material forms a kind of tar concrete, so that the rain, the wind and the wear of the tires does not loosen the binding material. It penetrates from one-half to one and one-half inches below the surface. The action of the treated surface is very slightly like rubber, which allows of a very small motion of the individual particles without tearing them loose from the binding material, and it also has considerable deadening effect upon the noise of vehicle wheels. Under ordinary conditions, where the traffic is not excessive, an application will last about two years, but under severe usage it should be applied more often.

After several applications have been made the road surface becomes much better, and approximately only one-half the material is necessary for the second and third applications. When first applied the high spots in the road do not absorb as much as the hollows, as the material quickly drains off. These hollows are then filled with screenings, which are more firmly united, the result being that the original high spots are the first to be worn off, and by the time the second application is made are found to be the low spots, which now receive their due share of the material; so it can be seen by successive applications the road surface will eventually become very uniform and well impregnated, and each application will last considerably longer than the previous one.

Another advantage which this process possesses is in the fact that the water does not penetrate the road, and, therefore, frost is prevented from cracking the

surface, which is one of the prime factors in preparing the way for further destruction. A road treated in this way is also practically dustless, and there is nothing which can stick to the feet and be tracked into houses, as is often the case with oiled roads.

The cost of applying this material varies between four and six cents a square yard, according to the nature of the road. Varying with the conditions, more or less of the tarvia is absorbed, and when the road is very uneven a much larger proportion of screenings is necessary. The second and third applications are less expensive, owing to the reduced amount of material required, and after three applications a treatment every three years, it is claimed, will keep ordinary roads in excellent condition.—*Albany Journal.*

Public Improvements in Minneapolis.

The city of Minneapolis expended more than a million dollars during 1906 for city improvements, under the direction of Andrew Rinker, city engineer. The work included the construction of pavements, water mains, sidewalks, curbs, gutters, sewers, bridges, street sprinkling and various ward work. An unusual amount of paving, probably more than ever before, was laid and in addition to the new work all the asphalt streets in the down town section were resurfaced at a cost of $167,000, thus making 7.04 miles of street as good as new. The new paving consisted of 4.07 miles of creosoted wood block paving at a cost of $171,395; 1¼ mile of macadam, at $21,442; 0.77 mile of brick, at $23,601; 1 mile of sandstone, at $33,842; 0.40 mile of granite, at $6,502.78; 1.17 mile granite curbing, at $5,234; 0.56 mile of sandstone curbing, at $1,896, and 15.8 miles of cement curb at $33,324.

The details of the other improvements made during the year are not yet available.

Illinois City Councils Cannot Modify Sidewalk Grades for Private Purposes.

The Illinois supreme court handed down a decision December 24 declaring against raised sidewalks for business purposes. The case was that of The People vs. the Chicago Cold Storage Warehouse Company. The city council gave the company permission to maintain a sidewalk in front of its warehouse at 1532 Indiana avenue at a level seven or eight feet higher than the city grade of the sidewalks in that locality. The permit was sought for the purpose of allowing goods to be removed from the warehouse and loaded into wagons by the simple use of trucks, without lifting or employing skids, shifting platforms or elevators.

The court decided that a city council can not grant any person the right to raise or lower a sidewalk to facilitate the transaction of private business.

Italian Street Paving and Buildings.

BY ALFRED F. POTTS, INDIANAPOLIS, IND.

The accompanying snap shot shows a street paving scene in one of the suburbs of Naples. These slabs of granite are 18x30x12 inches thick and are laid on a bed of concrete. It is needless to say that once laid no resurfacing is necessary in the same generation or century, for that matter. These Neapolitans do not do much experimenting with modern methods. They found these same slabs of granite in the streets of Pompeii when it was unearthed. They had been laid hundreds of years before the Christian era and are as sound as when placed, save only where ruts were worn by the wheels of the chariots.

ITALIAN GRANITE PAVING BLOCKS.

The main streets of Naples are paved with these granite slabs, while all the rest are macadamized with crushed lava from Vesuvius. After a rain for a little while there is a white paste-like surface, but it soon dries and makes a beautiful street. If any one hesitates about the durability of cement, he should inspect some of these ancient ruins where the Roman brick or stone was laid in cement, which has withstood the attacks of the

elements and the vandalism of more than twenty centuries. But it must be admitted from the evidence of all these ruins of the Roman builders that their thin brick was the king of building materials. Acres of buildings of Roman brick are to be found at every historic point in as perfect condition as though they were built yesterday.

State Road Construction in Michigan.

In a report prepared for the legislature, Horatio C. Earle, state highway commissioner of Michigan, covered the seventeen months since the establishment of the good roads department. The total expenses of the department have been $13,436.51, which includes $1,500 for maps. He reports the construction of 52 miles of stone roads, 33 miles of specially prepared gravel roads, and 90 miles of gravel and clay roads. Commissioner Earle states that the finest road in the state is the two miles between Lansing and the Michigan Agricultural College. It is 22 feet wide and cost $13,485, of which the state paid $2,000.

Stimulating Interest in Parks.

A series of prizes ranging in value from $1 to $10 has been offered to students of the schools and colleges in Rhode Island by the Public Park Association of Providence for essays to arouse interest in park matters on the following subjects:

What is the most important reason for the establishment of park systems?

Why has the park question grown so rapidly in importance and public interest in all the large cities of America?

What would be the effect upon the people if there were no parks or open recreation places, and are public reservations vital to the public welfare?

Why can not parks be provided at one time as well as another?

What was the special reason for creating the Metropolitan Park district of Providence Plantations, and why should the state of Rhode Island issue bonds for its parks?

Why does the present generation need park lands more than the last one did, and why will the next generation need them more than the present one? Why is the need rapidly increasing in Rhode Island?

Would a proper and comprehensive park system be expected to add to the taxes or to diminish them? Would it add to the cost of living or diminish it?

What is the moral effect of parks in large cities?

What classes of people would be most benefited by a Metropolitan park system?

Why are parks especially advocated by business organizations and boards of trade?

Why are they approved by the members of great labor organizations? Why by local improvement socities? Why by historical and patriotic societies? Why by horticultural and naturalist societies?

If parks add to the prosperity of one part of the state, how do they affect any other part of the state, or add to the revenue of the state as a whole?

In what ways do the proposed parks affect the public water supply or the public drainage systems?

Should the first work be to finish and beautify the existing parks, or to provide for the establishment of new ones?

What is your idea of an ideal park system and what special features should be provided?

Describe the proposed Metropolitan park system or some part of it.

What other places in Rhode Island, not mentioned in the report, should be owned by the state or by the general public?

How do the cities and towns of Rhode Island compare in the matter of parks with other cities in the United States?

MUNICIPAL AND TECHNICAL LITERATURE

New Publications.

Earth and Rock Excavation. With tables and many diagrams and engravings, by Charles Prelini, C. E. Cloth, 357 pp. $3 net. D. Van Nostrand Co., New York City.

A book on the general subject of earth and rock excavation is very welcome, because there is no book in English which attempts to cover the ground. Mr. Prelini has a book on tunneling and there is Drinker's monumental work on the same subject. Gillette gives some data on cost of handling materials. There are books on the calculation of earthwork. There is, however, no such treatise as the one under consideration. While it is general in its nature and its examples of methods and machines are not as numerous as they might be, the student of engineering will gain a good knowledge of the principles of the science of moving earth and

many hints regarding the details of methods.

The book comprises a discussion of the graphical representation and calculation of earth work, descriptions of classes of machines for excavating and transporting rock, consideration of methods of planning and executing excavations of various sorts and determining the cost of the work, and descriptions of several large projects involving heavy excavations, mainly canals, completed and in prospect.

Mr. Prelini's early training seems to have been on Italian and French work, and his foreign examples are drawn mainly from these countries. Either his practice in America has been confined to contracts on which a few kinds of machines have been used or he has confined his illustrations to the cuts which he could procure from manufacturers, for he describes very few machines and does not mention many of the successful machines which are in use in various sections of the country. The book, however, does not claim to be encyclopedic in its character, and enough is given to serve the evident general purpose of awakening the interest of the student in the subject of earth excavation and transportation, although the book cannot serve satisfactorily as a reference book for machines and methods.

Some attempt is made to give data for computing cost of work, but the basis is sometimes that of European methods and the prices selected are far from those prevailing generally, so that this is not the most reliable feature of the book.

The author has some pronounced opinions on subjects ranging from the use of the long-handled shovel to the selection of the sea-level plan for the Panama canal, and does not hesitate to express them even when they are somewhat irrelevant.

Every engineer who handles earth or estimates the work of doing so will want this book, because it is the only good book which covers any large part of the subject. His only regret will be that he does not get a book of twice the size at double the cost.

Beton Kalender, 1907. Taschenbuch fuer Beton und Eisenbetonbau, sowie die verwandten Faecher. Unter Mitwirkung hervorragender Fachmaenner herausgegeben von der Zeitschrift "Beton und Eisen." Two volumes, 296 and 426 pp. Pocket size. 4 marks. $1.20, including postage. Wilhelm Ernst & Sohn, Berlin, Germany.

The first annual appearance of this calendar was made for 1906 and the notice of the book made in MUNICIPAL ENGINEERING resulted in several requests for it, which could not be filled because the edition had been exhausted. The edition for 1907 appears quite early on this account, no doubt, and the book has been considerably enlarged and improved.

The first part contains the 27 pages of calendar and the usual general statistics, telegraph and postal rates, conversion tables for money, weights and measures, tables of powers, roots, reciprocals, etc., five place logarithms of numbers and trigonometric functions, properties of circles, geometrical tables and formulae, trigonometrical, mensuration, and leveling formulae, strength of materials and of beams of various forms, materials and methods of support, specific gravity and weight tables, properties of steel beams and columns of various sections, special properties of various forms of steel bars, sheets and network for concrete reinforcement.

It also discusses wood and its preservation, lime, cement, and mortar, giving the standard test requirements in various countries of Europe and America; also concrete and various methods of making and testing.

The concrete mixers are described and illustrated in considerable detail, all the prominent machines of the world being shown. Examples of the cost of structures are given and tables of wages and hours of work in German cities, price lists of lumber, stone, sand, etc., making a valuable collection of data for estimating the cost of engineering construction in German cities. Building standards are given and a table of the principal dimensions of prominent concrete bridges in Germany; also the full specifications of the German government for cement, with full explanations of all paragraphs. There is a short digest of patent laws in Germany and a tabular statement of patent office regulations and methods of various countries. A list of prominent laboratories throughout Europe with a few in the United States is given, also lists of technical associations, and associations of cement manufacturers and dealers and books on cement and concrete, general engineering handbooks and technical periodicals.

The second part is a practical treatise on concrete construction, divided into chapters, which are written by experts in their subjects.

Fr. von Emperger treats of the subjects of foundations of massive and reinforced concrete, concrete piles, etc.; concrete and reinforced concrete columns; the theory of reinforced concrete arches; the construction of reinforced cement stairs; the laying of pavements, using concrete, including sidewalks.

R. Janesch devotes himself to floors and roofs of many systems and designs.

R. Braunwald goes into detail on the manufacture of concrete pipe, and artificial stone, including high class stone for building and ornamentation, statuary and other artistic uses.

F. Schlueter gives several examples of reservoir construction in reinforced concrete.

H. Albrecht treats of hollow concrete block manufacture, showing several American machines.

J. Krueger describes the construction of retaining walls, bridge piers, docks, and the like, in plain and reinforced concrete.

W. Ast gives a little information about reinforced concrete railroad ties.

O. Gottschalk gives a general view of factory and warehouse construction.

A. Rella and L. Roth have a short chapter on the purification of water.

P. Ziegler has good chapters on weirs and dams.

B. Bransewetter has a valuable chapter on overflow chambers and canals.

O. Rappold describes methods of erecting forms for concrete building construction.

R. Saliger describes chimney construction in reinforced concrete.

J. A. Spitzer shows many methods of constructing concrete girder bridges.

H. Schwey has a chapter on the drainage of towns by canals and sewers, with special reference to the use of cement and concrete, plain and reinforced.

Prof. E. Moersch gives the theories and formulae for the computation of arched concrete bridges, and describes the construction of silos.

M. Bazali writes on the construction of walls with cement blocks and reinforced concrete of various forms.

M. Moeller treats of the uses of concrete in construction of levees, wing walls and bank protection of rivers, harbors and canals.

H. Ehrlich discusses the construction of railroad bridges in concrete, and Schnapp and Englehard, canal bridges and aqueducts.

Rank Brothers state the advantages of reinforced concrete construction for theaters.

G. Gottschalk goes into detail on roof construction in reinforced concrete.

All the chapters are fully illustrated and for one who can read German the book should be a very valuable reference book. It is written and edited by experts and within the limits of its size is not approached in value. A similar book in English is much to be desired. MUNICIPAL ENGINEERING can supply the book at the price named.

A Handbook on Reinforced Concrete for Architects, Engineers and Contractors. By F. D. Warren. 271 pp., cloth. $2.50 net. D. Van Nostrand Co., New York City.

The author has developed the formulae and tables for computing dimensions of reinforced concrete beams, slabs, etc., on the supposition that the concrete will carry an appreciable amount of tension. While this may be true early in the life of the structure, the probability of the loss of the tensile strength of the concrete is too great to warrant the construction of the beam or slab upon this assumption. Very few results of tests are presented as authority for the values of the tension permissible in the concrete in these forms and they depart materially from actual practical conditions, so that the tables so conveniently arranged and so fully computed are, after all, not safe to use without careful checking with safer theories. These remarks apply to the first six tables.

Table vii gives the properties of columns reinforced with eight vertical rods. Tables viii to xii inclusive, give cost of concrete and steel and total cost of the various beams, floors and columns used in the preceding tables, on stated assumptions of unit prices; table xii gives quantities of materials in concrete of various proportions, and table xiii the relative strength of various mixtures.

The latter part of the book is devoted to the discussion of roof girders of various design of steel shapes encased in concrete, including data regarding cost. As in the other parts of the book, the reader must test the theoretical results of this discussion by comparison with practical examples before accepting them.

In short, the book is prepared upon the basis of a theory not generally accepted, based upon tests not sufficiently extended, and seems to have been developed by one whose practical experience is limited and whose respect for theory is thereby magnified.

Tests of Reinforced Concrete Beams.

Bulletin No. 4, Tests of Reinforced Concrete Beams, Series of 1905, University of Illinois Engineering Experiment Station, has been reprinted, and copies may now be had as long as the supply lasts upon application to the Engineering Experiment Station, Urbana, Ill.

ORGANIZATIONS AND INDIVIDUALS

Indiana Engineering Society—Iowa Engineering Society—Nebraska Cement Users — Jamestown Cement Exhibit—Safety Devices Exhibit — Civil Government—Civil Service—Technical Meetings—Personal Notes.

Indiana Engineering Society.

The Indiana Engineering Society held one of the most successful of its twenty-seven conventions at Indianapolis Jan. 17, 18 and 19. One of the subjects considered was interurban railways, their engineering, by President Robert P. Woods, some statistics of Indiana roads by J. P. Moore, paving between tracks by B. J. T. Jeup, and car braking by Prof. H. T. Plumb. Others were railroads, some statistics by Prof. H. O. Garman, the work of the State Railroad Commmission by Commissioner Union B. Hunt, Indianapolis track elevation by Chas. C. Brown, B. J. T. Jeup and J. W. Stearns; bridges with a report on present tendencies by A. J. Hammond, and a consideration of estimates of costs by B. F. Nesbit; concrete with a report on the development of reinforced concrete construction in Indiana by D. V. Moore, a paper by Julius Kahn of Detroit on reinforced concrete and one by M. L. Morris on a reinforced concrete sewer in South Bend; water, with talks by L. S. Alter on a drainage problem and M. H. Downey on the Kankakee drainage, and a paper on water softening by W. D. Collins; stream pollution, with an exhaustive paper on a sanitary survey of White river by Prof. R. L. Sackett, and a report on the basis for proposed legislation by Chas. C. Brown. Mechanical engineering was also represented by a paper on a gasoline engine by L. O. Danse, one on the design and construction of an asphalt paving plant by Chas. Brossmann, Jr., and one on performance of locomotives under different steam pressures. Electricity was represented with papers on the telephone by Prof. A. B. Smith and the mercury vapor lamp by Prof. A. N. Topping. Notable papers on materials of construction were the report of the committee and a paper on unit stresses for designing timber structures by Prof. W. K. Hatt and one on the recovery of steel and iron from overstrain by Prof. E. L. Hancock.

This solid program was relieved by a banquet on the first evening of the convention, tendered by the Indianapolis members of the association and attended also by members of the Indianapolis Technical Club, which was attended by more than a hundred engineers and greatly advanced the sociability of the meeting. There was also an excursion on Friday afternoon to some of the new reinforced concrete buildings in the city and the Atlas Engine Works.

The society now has over 185 members and is increasing rapidly in numbers as the various branches of engineering in the state are becoming interested in its work.

Prof. W. K. Hatt of Lafayette was elected president, D. B. Luten of Indianapolis vice president, E. E. Watts of Princeton and Chas. Brossmann, Jr., of Indianapolis trustees and Chas. C. Brown of Indianapolis, secretary.

Iowa Engineering Society.

The nineteenth annual meeting of the Iowa Engineering Society was held at Ottumwa, Iowa, Jan. 9 and 10. The program included a visit to the pumping station of the Public Water Co., the pork packing plant of the J. C. Morrell Packing Co., and the power station of the Ottumwa Railway & Light Co.

The papers presented were as follows: "Bitulithic Pavement," by C. S. Magowan, Iowa City; "Report of Committee on Railroad Engineering," by W. G. Raymond, Iowa City; "Key West Extension of the Florida and East Coast Railway," by A. C. Irwin, Des Moines, Iowa; "Report of the Committee on Reinforced Concrete," by G. D. Dobson, Des Moines; "Report of Committee on Electric Railways," by J. D. Wardle, Cedar Rapids; "Report of the Committee on Drainage," by L. E. Ashbaugh, Ames; "Report of the Committee on Roads and Pavements," by A. Marston, Ames; "Improvement of the Des Moines and Raccoon Rivers," by G. D. Dobson, Des Moines; "Improvement of the Mississippi River at Keokuk, Iowa," by S. N. Williams, Mt. Vernon.

At the adjournment of the meeting a

banquet was given by the City Council of Ottumwa.

The officers of the current year are: President, J. G. Ratcliffe, Waukon; vice president, A. J. Cox, Iowa City; secretary-treasurer, A. H. Ford, Iowa City; directors, C. R. Allen, Ottumwa, and W. H. Jackson, Des Moines.

The Nebraska Cement Users' Convention.

The Nebraska Cement Users' convention, which takes place at Grand Island, Neb., Feb. 6, 7 and 8 in the Liederkranz Hall, has completed arrangements and the outlook for a profitable meeting for all who attend is encouraging. The railroads will give reduced rates on the certificate plan. Hotel accommodations are ample. Rates from one to two dollars per day.

A good selection of block machines, brick machines, hand and power mixers, waterproofing compounds and all that goes to make up a concrete contractor's equipment will be on exhibition. Papers will be read on the making and laying of concrete blocks, on reinforcing of concrete structures, on sidewalks, on cellar bottoms and everything pertaining to concrete. Some of the best authorities on cement and its uses will take part in the discussions which will take place at the different meetings.

Cement Exhibits at the Jamestown Exposition.

In planning the exhibits at the Jamestown Exposition the Department of Mines and Metallurgy has decided to attempt to secure a more adequate representation of the different phases of the American cement industry than has been found possible at previous expositions. With this end in view, Mr. Edwin C. Eckel, the cement expert of the United States Geological Survey, was appointed commissioner in charge of cement exhibits. It is Mr. Eckel's intention to obtain as comprehensive a set of exhibits as possible, dealing with all the phases of the industry. The exhibits will include a representative series of raw materials, with plans, photographs and models showing processes of manufacture, testing and utilization. An attempt will be made to give this exhibit an educational character by giving full data on the labels accompanying the various specimens. Cement literature, both in book and periodical form, will be shown, while the United States Geological Survey will exhibit maps and charts bearing on the industry.

A considerable portion of the space alotted to this industry has already been taken by cement manufacturers and makers of concrete blocks.

Exposition of Safety Devices.

The first International Exposition of Safety Devices began January 29, 1907, and continues two weeks at the American Museum of Natural History, New York City.

The exhibits include safety devices for wood and metal-working machinery, stamping, grinding and polishing machines; safeguards for boilers, elevators, windlasses, cranes and hoisting machinery, textiles and building trades, safety lamps and explosives, quarrying and agriculture, chemical industries, safety from fire, railway and trolley safety.

The object of this exposition is to awaken the American public to the necessity of doing something to lessen the causes of accidents to American life and labor by means of a permanent museum of safety devices, where all problems of safe-guarding life and limb can be studied in their working details.

Study of Civil Government.

The topic of special research of college students in their study of city government under the direction of the National Municipal League is "The Relation of the Municipality to the Water Supply." The outline proposed is as follows:

Relation to the Municipality to the Water Supply.

I. When furnished by private enterprises.

1. Conditions of franchise.
(a) Requirements of service.
(b) Maximum charges for public and private supply.
(c) Money payments to the city treasury. (Distinguish if possible between franchise payments and taxes.)
2. Capitalization and finance of water companies.
3. Control of municipal authorities over the accounts of the company.
4. Right of city to purchase plant and conditions of purchase.
5. Daily per capita consumption.
6. Use of water meters.
7. Condition of supply and relation to public health.
8. Plans for improvement of supply.

II. When furnished by public authority—municipal water works.

1. History of establishment of water supply to consumers.
2. Adequacy of supply.
3. Charges to consumers.
4. Average daily per capita consumption.
5. Experience with water meters, if such have been used.
6. Relation of water supply to public health.
7. Present condition of the works.
8. Profits.
9. Plans for improvement.

U. S. Civil Service Examinations.

Examinations will be held as follows at the usual places:

Feb. 6 and 7 for examiner of surveys General Land Office at $4 a day and traveling expenses with future promotions to $5 and $6 every day with allowances.

Technical Meetings.

The second annual convention of the Cement Users Association of Nebraska will be held at Grand Island, Neb., February 6, 7 and 8. Manufacturers of hollow block machinery, tools, compounds or other products used by the trade are invited to exhibit their wares.

The next annual meeting of the American Ceramic Society will be held in St. Louis February 4, 5 and 6. The National Paving Brick Manufacturers Association will commence its session February 5. The National Brick Manufacturers Association will begin its twenty-first national convention on February 6 and continue February 7, 8 and 9, after which the time of delegates will be devoted to visiting clay plants, sightseeing, etc. T. A. Randall, secretary, Indianapolis, Ind.

The annual meeting of the New England Gas Association will be held at Boston, Mass., February 26. N. W. Gifford, East Boston, secretary.

The annual meeting of the Association of Ontario Land Surveyors will be held at Toronto, Ont., February 26. Killaly Gamble, secretary, 405 Temple building, Toronto.

The annual meeting and dinner of the Western Society of Engineers were held January 8 at Chicago. Officers for the year of 1907 were elected as follows: President, W. L. Abbott; vice presidents, Andrews Allen, E. N. Layfield and A. N. Talbot; treasurer, A. Reichmann; secretary, J. H. Warder.

The annual meeting of the Minnesota Surveyors and Engineers Society was held at St. Paul January 17. Among the papers on the program were the following: "Concrete Bridges," C. A. P. Turner; "Good Roads Labors," Prof. W. R. Hoag; "Sewage Disposal for Flat Districts," Thos. E. McGilvray; "Immigration," Geo. Sublette; "Compressed Air from Water," J. E. Hill.

The spring meeting of the American Society of the Mechanical Engineers will be held at Indianapolis May 28-31 inclusive. Owing to the fact that Indianapolis is the third largest center of the automobile industry in the United States, considerable attention will be given at the meeting to the mechanical engineering of the automobile. The meeting's committee will be pleased to receive offers of technical papers on this subject, but no papers will be received after April 15, as all papers must be distributed to the membership of the society at least 30 days in advance of the meeting at which it is to be read.

The Public Utilities Association of Indiana was organized at Indianapolis, Ind., December 28, when constitution and bylaws were adopted. The membership is to be drawn from the managers of electric and water power plants operating in the state. The constitution states that the object of the association is to bring into closer touch the managers and officials to promote discussion on the many questions of vital interest in the management and operation of light, power and water plants. The officers are: President, B. W. Hubbard, Mooresville; vice-president, W. L. Meade, Spencer; secretary, J. A. Shank, Peru.

The U. S. Wood Preservers' Association held a very interesting meeting in Memphis, Jan. 15, 16 and 17, at which valuable papers were presented by experts. Several of these papers will be printed in MUNICIPAL ENGINEERING. Th officers elected for 1907 were C. W. Lowry, president, general manager of Columbia Creosoting Co., Shirley, Ind.; David Allerton, first vice president, superintendent O. R. & N. railroad wood preserving works, Wyeth, Ore.; Walter Buehler, second vice president, consulting engineer Kettle River Quarries Co., Minneapolis, Minn.; Mr. Valentine, third vice president, with Eppinger & Russell, New York City; C. W. Berry, secretary and treasurer, superintendent Union Pacific railroad preserving works, Laramie, Wyo.

The Municipal League of North Dakota has been organized with the following officers, elected for two years: J. A. Johnson, mayor of Fargo, president; Thos. H. Hugh, city attorney of Larimore, first vice president; Frank Whitman, mayor of Devil's Lake, second vice president; Lee Combs, city attorney of Valley City, secretary; Geo. E. Duis, mayor of Grand Forks, treasurer.

Personal Notes.

J. W. Barnett has been re-elected city engineer at Athens, Ga.

Luther Dean has been re-elected engineer at Taunton, N. J.

Julius Frehsee has been appointed city engineer at Lockport, N. Y.

Philip D. Borden has been appointed city engineer at Fall River, Mass.

Joshua Doughty, Jr., has been appointed city engineer at Bound Brook, N. J.

A. C. Schrader has been re-elected engineer of the West Park Board, Chicago.

St. George Richardson has been re-elected county surveyor of Shelby county, Tenn.

William H. Lawton, M. Am. Soc. C. E., has been elected city engineer at Newport, R. I.

John M. Connolly has resigned as first

assistant superintendent of waterworks at Troy, N. Y.

F. J. Eppele, Trenton, N. J., has been re-elected county surveyor of Mercer county, N. J.

Alba Arnold has succeeded G. H. Stevenson as county surveyor of Tippecanoe county, Indiana.

J. N. Ambler has been elected city engineer and superintendent of waterworks at Winston, N. C.

F. C. Snow, formerly assistant engineer of Sandusky, Ohio, has been appointed city engineer at Findlay, Ohio.

Frank J. Schnauber, retiring city engineer at Syracuse, N. Y., will open an engineering office in that city.

Kenneth D. Owen, son of James Owen, M. Am. Soc. C. E., has been appointed town surveyor at Montclair, N. J.

William R. Headden has been appointed assistant city engineer at Troy, N. Y., succeeding Frank Gudley, resigned.

T. C. Hughes, formerly assistant city engineer of Kansas City, Mo., has been elected city engineer at Tulsa, I. T.

Frederick C. Stevens, of Attica, N. Y., has been appointed state superintendent of public works by Governor Hughes.

Mr. Isidro Soler has been appointed chief engineer of the Province of Pinar del Rio, Cuba, and entered on his duties December 3, 1906.

O. F. Wasmansdorff, city engineer of Lewistown, Mont., has been elected county surveyor of Fergus county, Mont., and will retain both offices.

Levi E. Farnham has been reappointed city engineer and Robert Hollingsworth appointed chief engineer of the water department at Camden, N. J.

Hon. Jacob Hanssling was inaugurated mayor of Newark, N. J., January 1, and Arthur N. Denman was formally elected president of the board of works.

Malcolm Hart Crump, consulting engineer and geologist, Bowling Green, Ky., has been appointed commissioner from Kentucky to the Jamestown exposition.

Acting Mayor John Pfeiffer, who has served as mayor of Perth Amboy, N. J., since the death of Mayor Brace, was succeeded January 1 by Mayor Albert Bollschweiler.

Mr. Otto Raymond Barnett, 1515 Monadnock Block, continues the patent law business formerly conducted in partnership with the late J. H. Raymond, and is assisted by Percival H. Truman.

Frederick S. Wayne, Esq., formerly of the Robins Conveying Belt Company, of New York City, has been appointed eastern manager of the Mining and Scientific Press, with offices in No. 42 Broadway, New York.

William R. Hill, formerly chief engineer of construction of waterworks at Syracuse, N. Y., and later chief engineer of the Aqueduct Commission of New York City, has been appointed special deputy state engineer of New York.

Ernest R. Ackerman, Assoc. Am. Soc. C. E., president of the Lewrence Cement Company and State Senator from Union county, N. J., has been elected a fellow of the Royal Philatelic Society of London. He is the fifth American collector to be so honored.

R. O. Wynne Roberts, until recently in charge of the waterworks department at Capetown, South Africa, will return to England in April and will open an office as consulting engineer. He may be addressed in care of Ald. W. H. Williams, 3 Cable street, Liverpool.

Professor Robert L. Sackett, of Earlham College, has been appointed professor of municipal and sanitary engineering in the school of civil engineering at Purdue University, Lafayette, Ind. He succeeds Professor Seastone, who will enter a Chicago engineering firm.

Mr. J. W. Duntley, president of the Chicago Pneumatic Tool Company, sailed for Europe on Jan. 8 on business of the company. Several exhaustive tests of their tools were conducted during the year 1906 by large foreign institutions, with favorable results. While abroad he will visit the industrial institutions on the Continent.

B. N. Guion, civil and sanitary engineer, 1303 Washington avenue, Bronx borough, has been appointed in charge of the construction of buildings for the bureau of highways and sewers for the Borough of Bronx. The buildings are to be of concrete construction and about 20,000 barrels of cement will be used in the construction work.

Ralph I. Gates, secretary of the Chicago Portland Cement Company, died at his home, 4457 Ellis avenue, Chicago, January 16, aged 64 years. Death was due to Bright's disease. Mr. Gates was a pioneer in the cement business in the West. He was identified for a time with the Eagle Manufacturing Company, out of which grew the Gates Iron Works, and the Fraser, Chalmers Company. He left the Gates Iron Works in 1867 and organized the Anglo-American Portland Cement Company, the name of which was afterward changed to the Chicago Portland Cement Company.

MACHINERY AND TRADE

Sarco Asphalt Products.

The Standard Asphalt and Rubber Co., 944 First National Bank Building, Chicago, Ill., have works and refineries at Independence, Kans., close to large deposits of asphaltic materials from which they manufacture paving asphalt which is said to contain 100 per cent. bitumen; asphalt filler for brick and block pavements; matrix for combining with lime carbonates to produce mastic; asphalt roofing material, which is pliable and ductile; mineral rubber waterproofing to

stand any ordinary range of temperature; pipe dip which is air proof; insulating material which, when 1-8-inch thick will resist 12,000 volts; and mineral rubber for use with crude vegetable rubber in the manufacture of rubber goods. All these products have the trade-mark Sarco, and are now on the market for general use.

Roman Asbestic Hydraulic Cement.

The Cummings Cement Co., Akron, N. Y., have put on the market a cement for use in mortar in brick and stone masonry, which they call Roman Asbestic cement. It has hydraulic properties, but for plastering or pressed brick laying it is recommended to let the mortar lie over night and then retemper it. Fire proofing properties are ascribed to the cement which are claimed to make it slow setting. It is shipped ready to mix with sand and will carry, it is said, from four to six times its weight of sand.

Defective Asphalt Pavements in Philadelphia.

The question of defects in new asphalt pavements in Philadelphia is brought before the courts by the suit of the Robert C. Craig Company, large real estate owners, against the Barber Asphalt Paving Company, alleging violation of contract and specifications and defective pavements and refusing to pay for such pavements, claimed to be composed of inferior materials carelessly put together. This is in the nature of a test case, the inspection of many new pavements by means of holes cut in them showing deficiencies in quality and thickness affecting possibly $4,000,000 worth of asphalt pavements laid within the last year or two. Action by other property owners and by the city will be governed to some extent by the outcome of this suit.

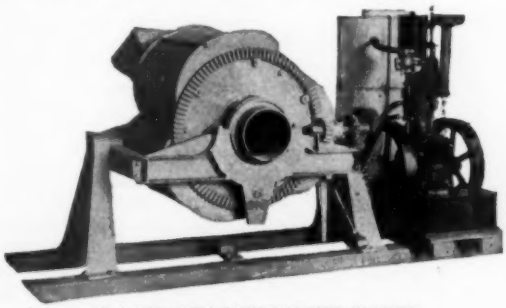
Concrete for Alley Paving in Denver.

Concrete paving is being used for alleys at Denver, Colo., and also for the tracks of the street railways, being laid between the rails and for a width of 2 feet outside. The concrete is 6 inches thick, with a bottom course of 1:3:7 and a top course of 1:2:4. The Denver City Tramways Co. first adopted this, at the suggestion of C. A. Trease, chief engineer. It uses a 3-inch bottom course of gravel concrete, and a 3-inch upper course of basalt concrete, the latter being laid while the former is wet. For the alleys, the city uses a 3-inch bed of cinders or gravel, wetted and rolled; then a 4-inch bed of the leaner concrete and a 2-inch bed of the richer concrete. Both beds are of gravel concrete, and are laid to form one mass. A single 6-inch bed of 1:2:4 concrete is proposed for future work.

The Clover Leaf Concrete Mixer.

A unique machine was exhibited at the exhibition held in connection with the convention of the National Association of Cement Users at Chicago, which attracted much attention. It was the Clover Leaf concrete mixer, so called from the form of cross section of the mixing chamber. The projections of the junctions of the lobes of the "leaf" form natural blades which turn and mix the concrete materials, which in their motion scour and clean the angles and prevent rolling or balling of the concrete.

Besides the revolution the mixer has



CLOVER LEAF CONCRETE MIXER.

two oscillations endwise with each revolution of which there are 25 to 30 a minute.

Materials are dumped into the chamber through a hopper at one end. The mixture is discharged through a tube on the axis at the other end by tipping the carriage, which is mounted on trunnions.

The machine may be run by hand or by a gasoline engine.

The power machines have capacities of 4½ to 9 cubic feet per charge or 25 to 90 cubic yards per 10 hours, requiring 2 to 4 horse-power.

Full information will be given by the Clover Leaf Machine Co., South Bend, Ind.

Hercules Machine at Chicago Convention.

At the Cement Users' convention recently held in Chicago, the exhibition of the Century Cement Machine Co., Rochester, N. Y., was a prominent feature. Over one hundred blocks of different sizes and designs, all made on the excellent Hercules machine were built into two walls, front and back of the allotted space.

The exhibition also showed many designs of coping and ornamental work,

and the entire exhibit was the center of an admiring throng during the entire convention.

A sign stretched above the entire length of the back wall advised to "Listen to what the others are going to do, then see what the Hercules has done."

The demonstration of the Hercules, which was freely given to all interested, clearly proved the claims of the machine. The strength of the Hercules is in keeping with its name, while the simplicity of mechanism and operation is remarkable. Great interest was created when the operators in record-breaking time produced two blocks of different size and design on the same machine at one time.

The Hercules is a face-down machine. Tamping is done directly on the face, thus insuring a clear, sharp impression.

Besides a large domestic trade, the makers of the Hercules are going after the foreign business in their usual aggressive manner, and have machines now in operation in nearly every civilized country in the world.

Clinton Wire Lath.

A new departure in catalogs is represented by one issued by the Clinton Wire Cloth Company, Clinton, Mass., entitled "Clinton Wire Lath." The introduction partakes of the nature of the preface to a technical book, and describes briefly and sufficiently the advantages of Clinton wire lath. An important feature is the specifications for plastering, describing the composition of the plaster which is recommended by the Clinton company. This plaster was only recommended after a series of exhaustive tests had been made of it by Prof. Ira H. Woolson of Columbia University, New York, a brief resume of which is also given. Directions follow for lathing and plastering, for decorative, ceiling and cornice work, solid filled and hollow partitions, solid and hollow walls, exterior walls, false columns, forced air ducts, repairing damaged terra cotta hollow tile floor arches with wire lath, illustrated with drawings and photos of methods and applications. A list of some representative buildings, ranging from residences to skyscrapers, in which the lath has been used, affords an idea of the varied nature of construction in which the lath finds application.

The catalog, which measures 6 by 9 inches, is handsomely and substantially bound in boards, the embossed cover bearing a medallion showing the Maine Memorial Chapel at the new U. S. Naval Academy at Annapolis, the plaster work in which was done on the Clinton wire lath. Aside from its typographical excellence, the contents of the catalog are of so unusual and valuable a nature that they ought to secure it a prominent place as a handbook on lathing and plastering in the libraries of architects, engineers, contractors and builders. A copy of the catalog will be sent free on application. It is published by Bruce & Banning, New York.

The Machine Rock Drill a Factor in Our Prosperity.

Less than fifty years ago the State of Massachusetts set itself a task to excavate a tunnel five miles long through a rocky formation, and to the audacity of its promoters is due the credit for providing an opportunity to inaugurate the first practical rock drilling machine, by the use of which the State of Massachusetts was enabled to complete its task and the "Hoosac" tunnel with the "Burleigh" rock drill became subjects of history, with this difference, however: the tunnel was finished, but the practical rock drilling machine had only commenced its existence. The "Burleigh" rock drill was soon superseded by other designs which succeeded or failed in demonstrating their fitness for the work, until at the present time we have rock drilling machines which have earned for themselves an enviable reputation and place in the industrial world.

In times of industrial depression we quickly set about finding out and, if possible, remedying the cause, but in periods of industrial prosperity we get so busy that we have no time to give to a consideration of the side to our prosperity except maybe a passing thought that is due to our supremacy in industrial lines. However, no one, we think, will care to deny that a position in the front ranks of industry can be secured and maintained only by utilizing the best and quickest methods of production and transportation. Coal and minerals have to be mined and railroads and canals built to facilitate transportation; congestion in cities has to be relieved by providing tunnels and subways. Rock has to be quarried for building purposes, and more than one dangerous waterway has been made safe by removing the rock obstruction to the channel.

All of the above work has been facilitated and the magnitude of its accomplishment made possible by the use of machine rock drills, and it is safe to say that if the use of all rock drills now at work were to be suddenly stopped, the industrial world would be completely stagnated.

Realizing the importance of the field covered by rock drilling machinery the Chicago Pneumatic Tool Company has entered it with a line of Chicago "Giant" rock drills. These rock drills, with their

mountings, have been carefully designed and developed, and they offer them as the fittest in the market, being simple, effective and reliable. The Chicago company has in course of preparation a very exhaustive catalog, which will be received from the printers at an early date, and all parties interested will receive copy upon application.

Trade Publications.

The American Diamond Rock Drill Co., Box 1442, New York City, issues a full catalog entitled "The Diamond Drill and Its Work" which is more than usually full in its explanations and descriptions of methods.

The Western Electric Company issues a description of its new Hawthorne works for the manufacture of electric power apparatus.

The Keasbey and Mattison Co., Ambler, Pa., issue a new catalog of the Shingle, Slate and Sheathing Co., Ambler, Pa., makers of asbestos products, for which they are sole selling agents.

The Century Cement Machine Co., Rochester, N. Y., issue a new and handsome catalog of the Hercules cement stone machine, illustrating the machine, its appurtenances, the products and many handsome buildings constructed of them.

Arthur Koppel Co., 1601 Machesney Bldg., Pittsburg, Pa., issue a map showing the location of most of their offices and plants and illustrations of the cars, rails and locomotives and portable tracks of their manufacture.

The Clover Leaf Machine Co., formerly the Williams-Forrest Machine Co., South Bend, Ind., have a unique machine in their Cloverleaf concrete mixer, which they fully describe in a well-illustrated catalog.

The American District Steam Co., Lockport, N. Y., issue a booklet description of the improved Holly system of direct and exhaust district steam heating which is now in operation in 250 plants.

Trade Notes.

ASPHALT.

Cincinnati, O.—City Engineer Danenhower favors the establishment of a municipal asphalt plant in this city.

Dayton, O.—An ordinance providing for a bond issue of $25,000 for the purchase of an asphalt repair plant and appurtenances was introduced at a meeting of the city council, Jan. 7.

Columbus, O.—The board of public service will submit to the city council an ordinance to issue $15,000 bonds for establishing a municipal asphalt plant.

BRICK.

Emporia, Kas.—G. W. and F. C. Newman, Howard Dunlap, J. L. Kenyon, John Bland and J. D. Easton, of this city, and S. J. Allen, of Elk City, Kas., are the promoters of a proposed paving brick plant in this city.

Sunbury, Pa.—The Sunbury Brick Co. has been organized with officers as follows: President, Hon. C. R. Savidge, Sunbury; vice-president, Hon. Ellis Orvis, Bellefonte; treasurer, Geo. Schoch, Selinsgrove; secretary, A. W. Duy, Bloomsbury; general manager, W. I. Harvey, Orvis; assistant manager, W. W. Swengel, Sunbury. The company proposes to equip its plant with the most modern and up-to-date machinery for the manufacture of high grade, dry press and wire-cut building brick, and vitrified paving brick.

CEMENT.

Winnipeg, Man.—A contract has been let for the machinery for the cement plant of the Commercial Cement Co., Ltd., recently organized by capitalists of this city, Grand Forks, N. D., and Park River. The plant is located at Rose Isle, Manitoba, about 75 miles southwest of this city. W. P. Alsip, of Winnipeg, is president, and Otto Babcock, of Grand Forks, N. D., is secretary, treasurer and general manager.

Toronto, Ont.—The Vancouver Portland Cement Co. has been incorporated with headquarters in this city.

Elk City, Kas.—The Central Portland Cement Co. made the first move towards the construction of its plant, 4½ miles east of this city, New Year's day, and since then, active work has been commenced. Capitalists of Buffalo, N. Y., own the plant.

Butte, Mont.—Butte Portland Cement Co. has been organized and a plant will be established near Logan for the manufacture of Portland Cement. The principal offices will be in this city. D. A. Morrison, of Whitehall, Mont., is interested.

Salina, Kas.—A company has been formed for building a large plant for the manufacture of cement between Hays City and Russell. Prof. Howerth, State Geologist, says the material will make a fine quality of cement.

Springfield, S. D.—The business men of this city are endeavoring to secure the establishment of a cement plant here.

Independence, Kas.—Harry and Roy Jones, of this city, are organizing a company for the establishment of a large cement manufacturing plant in Oklahoma.

Goshen, Ind.—The Sandusky Portland Cement Co., of Syracuse, Ind., is reported as having obtained options on land surrounding Dewart and Milford lakes and will work the marl beds at these points.

Pocatello, Idaho.—The establishment of an immense plant for the manufacture of Portland cement here this year is assured. C. W. Gray, district agent for the Western Loan and Savings Co., of Salt Lake City, is interested.

Dallas, Tex.—The plant of the Ida Portland Cement Co., whose works are located in West Dallas, will be enlarged at a cost of $1,000,000. S. H. Bassett, of St. Louis, is president of the company.

Crivitz, Wis.—A new cement plant to be called the New York-Wisconsin Cement Co., is contemplated here, the plant to be located at Rush Lake.

Allentown, Pa.—Charles A. Matcham has resigned as general manager of the Lehigh Portland Cement Co. His resignation takes effect February 1.

Mason City, Ia.—The Lehigh Portland Cement Co., of Allentown, Pa., closed options, Dec. 31, on 500 acres of land at $200 per acre near this city for the site of a cement mill to be erected next year. It is believed that the mill of the North-

western States Portland Cement Co., will be completed by June and the manufacture of cement begun.

Baker, Wash.—The Washington Portland Cement Co. has completed its new plant here and is now ready to take orders.

New York City.—The Lake Erie Portland Cement Co. has incorporated.

Portland, Me.—The Tehachapi Portland Cement Co. has been incorporated.

Pittsburg, Pa.—The Pittsburg Cement Corporation has been incorporated to manufacture all kinds of Portland cement.

Montreal, Que.—The Dominion Portland Cement Co., Ltd., has been incorporated to manufacture and deal in cement by Henry Domville, J. H. Redpath, H. E. Borrodville and others.

Trenton, N. J.—The Reliable Cement Construction Co., 147 E. State St., has been incorporated to manufacture Portland and other cement building materials, etc., by C. L. Wilson, D. S. Kennedy and E. L. Kem, all of 147 State St.

Iola, Kan.—Eastern capitalists have purchased the plant of the Iola Portland Cement Co. at this place and Dallas, Tex., for $5,000,000. The new officers are as follows: President, S. H. Bassett, St. Louis; vice-president, J. A. Lewis, St. Louis; secretary and treasurer, H. W. Perry, St. Louis.

J. C. McFarland & Co., contractors, of Chicago, Ill., are using Medusa waterproof compound, manufactured by the Sandusky Portland Cement Co., Sandusky, O., in waterproofing the colored cement tile which cover the roof of the new Union Station being constructed at Washington, D. C., by the Washington Terminal Co.

CONCRETE BLOCKS.

Terre Haute, Ind.—The Modern Concrete Machine Co. has been granted patents on its modern concrete block machine.

Aurora, Ill.—The Aurora Cement Grave and Vault Co., recently incorporated, is erecting a new building.

Cedar Springs, Mich.—The Perrin Brothers, Dorman & Ritchie Co. has been incorporated to manufacture and sell cement blocks by Wm. R. Perrin, Alfred M. Perrin, George W. Dorman and Jas. J. Ritchie, of this city.

Jackson, Mich.—The Hoosier Mfg. Co., of Auburn, Ind., the Concrete Block Machine Co., of Auburn, Ind., the Normandin Machine Co. and the Cement Machinery Co., of this city, have consolidated, under the name of the Cement Machinery Co. The company will make a specialty of installing complete concrete product plants throughout the United States and foreign countries. The export office is located at 29 Broadway, New York City. The officers are: President and general manager, Wm. F. Cowham; secretary and manager sales, Sid L. Wiltse; treasurer and manager finances, John W. Boardman, Jr.; general superintendent. Willis H. McDowell, Eugene McDowell, John W. Miller and P. C. Green are also connected with the company.

Elgin, Ill.—The Elgin Concrete and Structural Co. will install two new automatic cement building block machines manufactured by Harmon S. Palmer.

Perth Amboy, N. J.—The Perth Amboy Tile and Ceramic Co., Sayre Ave., has been incorporated to manufacture buildmaterials, terra cotta clay products, etc., by Ira C. Ostergaard, Lauritz Hansen, Waldeman and Niels Adolf Nielsen.

Russellville, Ind.—B. F. Scribner and others are planning to reorganize and enlarge the present burial vault and cement block plant at Greencastle, Ind., of the Concrete Construction Co., an Indianapolis concern.

Ogden, Utah.— Special.— Blackman & Griffin Co. desire to correspond with parties who desire to establish a cement brick or some other factory in a field where natural gas can be had for 5 cents per thousand feet.

New concrete block companies:

Binghamton, N. Y.—Diefendorf Cement Brick Machine Co.

Philadelphia, Pa.—Delaware Concrete Fiber Co.

Caribou, N. Y.—Caribou Hydraulic Stone Co.

Owatonna, Minn.—E. P. Elliott, of Minneapolis.

New Richland, Minn.—Walford Nelson.

Atlantic, Ia.—Berry Cement Block Co.

Redwood Falls, Minn.—O. A. Mason.

Glencoe, Minn.—M. C. Madsen.

Milwaukee, Wis.—Berthelet Concrete Co., J., W. T. and V. E. Berthelet.

Nashua, Ia.—A. and L. Bullen.

St. James, Minn.—St. James Title Mfg. Co.—A. W. and Henry Schweppe, Joseph Schmidt, Leverin Anderson and others.

Cleveland, O.—Century Concrete Co.—S. Q. Kerruish, G. W. Spooner, L. S. Stewart, W. S. Kerruish and G. E. Hartshorn.

New York, N. Y.—Allegheny Facing Brick and Concrete Co.—O. C. Parker, H. F. Horn and G. W. Rice, of Wellsville, N. Y., and W. S. Calhoun, of Genesee, Pa.

Detroit, Mich.—Detroit Concrete Shingle Co.

PURCHASE OF MACHINERY.

Winnipeg, Man.—Special.—Alfred J. Stevens, Avalon Block, is in the market for reinforced concrete, mixers, hoists, etc.

Greenwood, Miss.—Special.—C. W. Smith is in the market for cement block machinery and tools.

Lakewood, N. J.—Special.—Elwood Johnson is in the market for concrete block machinery.

St. Louis, Mo.—Special.—David Allan, 4345 Arco Circle, is in the market for concrete mixers.

Holyoke, Mass.—Bids are asked until 1:30 p. m., Feb. 1, for furnishing one 12-ton steam roller and taking one Buffalo-Pitts roller in exchange. Michael F. Walsh, Chrm. B. P. W.

Burlington, Vt.—Special.—T. B. Robinson advises us that he is in the market for concrete block machinery. He will commence work in the spring.

Artesia, N. Mex.—Special.—John R. Hodges desires the addresses of manufacturers of bucket or cup water elevators.

Murphysboro, Ill.—Special.—A. L. Smith, contr., is in the market for a hoist suitable for hoisting brick and stone.

Stillwater, Minn.—Special.—Lewis W. Clarke, Room 10, Mower Blk., advises us that he desires to purchase machinery and tools for pumping, waterworks, sewers and gradings and buildings.

St. Louis, Mo.—Special.—The Parker-Washington Co. advise us that they are in the market for a 10 or 15-ton macadam steam roller, new or second-hand.

Waverly, Ia.—Special.—George Blain, contr. and bldr. of general masonry, desires information regarding the circled, interlocking cement block molds.

Perth Amboy, N. J.—Special.—Edward V. Koyen, P. O. Box 52, is in the market for a cement building block machine and machines for sills and lintels.

Joplin, Mo.—The Joplin Cement Co. has been incorporated by W. B. Myers, Arch

McDonald, Chas. McDonald and A. G. McDonald.

Carysbrook, Va.—Special.—C. E. Jones advises us that he will soon be in the market for block and brick machines.

Omer, Mich.—Special.—S. W. Garrison desires to communicate with manufacturers of hand tamp machines and machines worked by hand leverage pressure for the manufacture of concrete blocks with hollow core.

Anderson, S. C.—Special.—The Cement Stone & Brick Works desires to correspond with some reliable cement drain machine manufacturing company.

Carysbrook, Va.—Special.—C. E. Jones will soon be in the market for block and brick machines.

Kirksville, Mo.—Special.—A. L. Holmes advises us that he desires to correspond with some reliable company regarding machinery for making and burning brick for paving and building purposes.

Towner, N. D.—Special.—Hank Olsen, Lock Box 32, is in the market for a good hand and power mixer.

Milwaukee, Wis.—Council passed an ordinance Jan. 21 requiring closed wagons for the transportation of sand.

West Allis, Wis.—Sealed bids are asked until Feb. 9 for furnishing a standard macadam roller of 10 or more tons weight. F. Phillips, Chrm. B. P. W.; L. F. Fish, Cy. Clk.

PURCHASE OF MATERIALS.

Omer, Mich.—Special.—C. D. Brooks is in the market for brick and tile.

Murphysboro, Ill.—Special.—A. L. Smith, contr., advises us that he is in the market for cement, patent plaster and brick.

St. Louis, Mo.—Special.—David Allen, 4345 Arco Circle, advises us that he desires to purchase cement, etc.

Greenwood, Miss.—Special.—C. W. Smith is in the market for lime.

Lakewood, N. J.—Special.—Elwood Johnson advises us that he is in the market for Portland cement.

MISCELLANEOUS.

The special committee of property owners in Downers Grove recently made a reporting strongly endorsing bitulithic pavement.

The Universal Destructor Co. has taken over the business of the Meldrum Co. and also the interests of Wm. F. Morse in New York City.

Pella, Ia.—The Pella Drain Tile and Brick Co. has been incorporated by W. Reitveld, Herman Reitveld, O. L. Reitveld, L. P. and Jesse Grundman.

Bancroft, Ia.—The Northwestern Drainage and Construction Co. has been organized and will engage in business.

Portsmouth, O.—The Barnes Sand and Gravel Co. has been incorporated by Chas. L. Barnes, Arthur H. Bannon, H. C. Barnes and Henry W. Heer.

Perth Amboy, N. J.—The plant of the Barber Asphalt Paving Co. for creosoting wood blocks, has been completed.

Newark, N. J.—B. M. Shanley & Sons Co. has been incorporated by W. C. Shanley and G. M. Richards, of Newark, and J. R. Shanley, of New York City. J. F. Shanley, who was connected with the old firm of B. M. and J. F. Shanley Co. will form a new contracting firm with his son, J. F. Shanley, Jr.

The Merchants' Association of New York announces that merchants' rates from the Central West, which is designated by the railroads as Central Passenger Association territory, will be in effect to New York City on February 9 to 13, inclusive, and March 2 to 5, inclusive, with a thirty-day return limit. The special rate is a fare and one-third for the round trip, the reduction being granted under the certificate plan.

SEWER PIPE.

Ft. Dodge, Ia.—The Plymouth Gypsum Co. is interested in the proposed establishment of a sewer-pipe plant here.

Patents Concerning Cement and Its Uses.

830,483. System of Reinforcement for Concrete and Similar Structures. Daniel B. Luten, Indianapolis, Ind.

830,518. Process of Mixing Ingredients. Alex Q. Nash, Sherman, Tex.

830,599. Fence Post. Geo. M. Koontz, Vanatta, O.

830,620. Cement Block Machine. Frederick A. Stare, Frankfort, Ind.

830,726. Machine for Making Artificial Stone Blocks. Athos C. Kynett and Emory D. Toops, Indianapolis, Ind.

830,747. Construction of Buildings. Daniel C. Stauffer, Canton, O.

830,824. Fence Post. Chas. F. Davis, Battle Creek, Mich.

830,840. Means for Handling Concrete Blocks. Harvey Z. Kline, Indianapolis, Ind.

830,848. Device for Securing Fence Wire to Posts. Orange D. Reeves, Indianapolis, Ind.

830,893. Concrete Wall Forming Apparatus. Harry P. Englehardt, New York, N. Y.

830,899. Machine for Molding Concrete or Cementitious Building Blocks. John H. Hendrickson, Cleveland, O.

830,954. Cement Fence Post. Ralph J. Angell, Clinton, Wis.

830,962. Artificial Stone Fence Post. Gerret and Herman Brink, Hudsonville, Mich.

830,997. Means of Securing Wires to Fence Posts. Wellington F. Hendershot, Grandstone City, Mich.

831,077. Cement Block Machine. Olof Johnson, Estherville, Iowa.

831,230. Building Block Machine. Samuel A. Latimer, Banges, Tex.

831,296. Manufacture of Artificial Stone (sand-lime). Jas. Purvis, Bowe's Park, and Thos. Rouse, Stamford Hill, England.

831,345. Wall Construction. John G. von Hofe, New York, N. Y.

831,461. Oliver Nolan, Minneapolis, Minn.

831,481. Constructing Piers. Frank Sherman, Philadelphia, Pa.

12,532. Mold for Sewers, etc. Jacob B. Blaw, Pittsburg, Pa. (Re-issue.)

831,596. Brickmaking Machine. Christian J. Boos, Jackson, Mich.

831,620. Machine for Molding Plastic Material. John Lovett, Martinsburg, W. Va.

831,658. Concrete Mixer. Henry Ericson, Chicago, Ill.

831,699. Concrete Chimney Top. John Baumgartner, Chattanooga, Tenn.

831,732. Plastic Building Block. Melville C. Mommsen, Armour, S. D.

831,781. Machine for Molding Building Blocks. Geo. F. Fisher, North Tonawanda, N. Y.

831,804. Anchoring Device for Concrete Construction. Julius Schirra, Pittsburg, Pa.

831,957. Mixing Machine. Wm. J. Judd, New York, N. Y.

832,074. Mold. Alfred E. Miller, Pittsfield, Ill.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

Chicago, Ill.—The council committee has postponed action in the proposed widening of Halsted St. on the West Side, until June.

Chattanooga, Tenn.—A bill will be introduced to amend the charter of this city to make some changes in the provisions regarding the creation of improvement districts.

CONTEMPLATED WORK.

Glandorf, O.—Main st. will be improved.

Ford, Mich.—Paving is contemplated for Biddle ave.

Bellevue, O.—Paving is contemplated for Castalia st.

Monticello, Ia.—The question of paving is being considered.

Webster City, Ia.—City council is considering street paving.

Altoona, Pa.—The macadamizing of Chestnut ave. is contemplated.

Shamokin, Pa.—An ordinance has been passed for paving Market st.

Wichita, Kans.—An ordinance has been passed to repave Grand ave.

Glencoe, Ill.—This village will construct 1 mile of macadam boulevard.

La Crosse, Wis.—Creosoted block paving is contemplated for Cost st.

Lorain, O.—The property owners on Reid st. will petition for paving.

Menominee, Mich.—Brick paving is contemplated for Ogden ave, and Main st.

Menominee, Mich.—Brick paving is contemplated for Ogden ave. and Main st.

Seattle, Wash.—Estimates have been submitted for paving 8 miles of streets.

Osceola, Ia.—Council is considering brick paving for the principal streets.

Little Rock, Ark.—Contracts will be let during February for additional paving.

Paxton, Ill.—City council has voted to issue $30,000 bonds for improving three streets.

Marietta, O.—City council has decided to pave a number of streets next summer.

Centralia, Ill.—The board of local improvements has decided to pave 11 blocks of streets.

Albion, Mich.—City council has decided to pave College and Broad sts. with asphalt.

Collingdale, Pa.—Will vote in Feb. on the issue of bonds for street improvements.

Joplin, Mo.—Estimates have been filed by City Engineer Van Frank for macadamizing 18th st.

Clifton Forge, Va.—Vitrified brick paving is contemplated for the principal streets.

Pana, Ill.—Paving is contemplated for Oak, Main, Poplar, 1st and 3rd sts., and two alleys.

Pasadena, Cal.—This city voted to issue $3,000,000 bonds for the proposed boulevard system.

Cedar Rapids, Ia.—Council has passed a resolution to pave seven blocks of S. 10th st. with brick.

Salt Lake City, Utah.—The property owners on W. 3d South st. are in favor of asphalt paving.

Boone, Ia.—Bids will be asked about March 1 for four blocks of brick paving. E. Cassberg, Cy. Engr.

Seattle, Wash.—Asphalt paving is contemplated on 14th and 15th aves., N. E., and Brooklyn ave.

Louisville, Ky.—Asphalt reconstruction is contemplated for 4th ave. Joseph P. Claybrook, Cy. Engr.

Jacksonville, Fla.—Ordinances have been passed to pave Forsythe st. and Florida ave. with brick.

Fond du Lac, Wis.—Council contemplates paving a number of streets with tar macadam and cement.

Syracuse, N. Y.—Danforth st. will be paved with brick or asphalt from N. Salina to N. Alwood st.

St. Joseph, Mo.—Concrete paving is contemplated for every unpaved ailley in the business district.

Ludington, Mich.—Mason County will vote on the issue of bonds for highway improvements.

Toledo, O.—A resolution has been passed to repave Summit ave. from Ohio st. to Michigan ave.

Waterloo, Ia.—City council will consider the question of paving about 3 miles of streets Feb. 11.

Des Moines, Ia.—Creosoted wood block paving is contemplated for Locust st. and asphalt for Forest ave.

Palo Alto, Cal.—About $80,000 will be expended for asphalt and macadam paving. John D. Boyd, Cy. Clk.

Lockland, O.—Ordinances have been passed for paving and improving Grand ave. and several other streets.

Adrian, Mich.—City council has decided to pave various streets with asphalt. James Blair, Cy. Engr.

Rochester, N. Y.—Macadam trap rock paving is contemplated for Seneca Parkway. C. Lang, Supt. Parks.

Williamsport, Pa.—About 20,000 sq. yds. of brick or asphalt paving is contemplated. Jas. F. Fisher, Cy. Engr.

Louisville, Ky.—Plans are being prepared for brick paving on Griffiths ave., 15th, Preston and other streets.

Chicago, Ill.—Plans were amended Jan. 16 for paving Superior and Erie sts. from N. State st. to the river.

Lansing, Mich.—Council has ordered Franklin ave. paved with brick on gravel foundation. H. A. Collar, Cy. Engr.

Little Rock, Ark.—Asphalt paving and concrete curb and gutters are contemplated in 22 blocks in the 5th st. dist.

Evansville, Wis.—Council has passed an ordinance requiring all sidewalks hereafter constructed to be of cement.

St. Louis, Mo.—A hearing on the proposed improvement of 26 streets, including King's Highway, will be held Feb. 8.

Kirksville, Mo.—Special.—A. L. Holmes advises us that the citizens of this city are considering the paving question.

Baltimore, Md.—An ordinance has been passed for paving the streets around the Center Markets with Belgian blocks.

Bloomington, Ill.—Brick paving is contemplated for Market, Leland, Jackson and Mason sts. Elmer Folsom, Cy. Engr.

Waterloo, Ia.—A resolution has been prepared providing for 33 blocks of brick and asphalt paving in East Waterloo.

Sturgeon Bay, Wis.—The question of paving Garland, St. John and Spruce sts. and Lawrence ave. is under consideration.

North Yakima, Wash.—A committee will investigate the question of the most suitable material for street paving here.

Evansville, Ind.—The bd. of pub. wks. contemplates paving many streets this year with brick, asphalt or other material.

Newport News, Va.—Will vote, Feb. 28, on the issue of $100,000 bonds for permanent street improvements. Mayor Buxton.

San Diego, Cal.—George W. Cooke, landscape architect, will make plans for the proposed boulevard and park improvements.

Mankato, Minn.—Tar macadam paving is contemplated for several business and residence streets. J. R. Thompson, Cy. Engr.

Belvidere, N. J.—The Warren county bd. of freeholders has appropriated $26,000 for a proposed macadam road in Harmony township.

Sheboygan, Wis.—Paving is proposed for Niagara and Erie aves. and N. 9th st. Macadam paving is contemplated on N. 6th st.

Milwaukee, Wis.—Plans are being formulated for macadamizing as boulevard, 22d ave. from National to Lincoln ave.

Hamilton, O.—The property owners on East ave. are discussing the advisability of paving that street with some permanent material.

Lawton, Okla.—Will vote Feb. 5, on the issue of $300,000 bonds for constructing and extending municipal improvements. Mayor Jones.

Quincy, Ill.—About 20,000 sq. yds. of brick paving is contemplated in Loth st. and 11,500 sq. yds. on Kentucky st. F. L. Hancock, Cy. Engr.

Binghamton, N. Y.—Bids will be asked soon for repaving those streets not included in the contracts awarded to A. D. Osborn, last year.

Hamilton, O.—City Engineer Burns has been directed to prepare plans for paving Sycamore and 7th sts. with asphalt, brick or bituminous macadam.

Wauseon, O.—Special contracts will be let early in February for paving W. Fulton st. J. S. Bailey, Mayor; Riggs & Sherman Co., Engrs., Toledo.

St. Joseph, Mo.—Ordiances will be introduced providing for brick paving of the roadways and artificial stone sidewalks on Mitchell ave.

Springfield, Ill.—Petitions are being circulated for paving Scarritt and Williams sts. and the drive leading into Washington Park with asphalt.

Bellefontaine, O.—Bids will be opened about March for paving N. Detroit st. with stone and cement curbing. G. D. McLaughlin, Chrm. Paving Com.

Atchison, Kas.—A resolution has been passed to construct 13,800 sq. yds. of brick paving and 7,880 ft. cement curb on S. 7th st. Fred Giddings, Cy. Engr.

Terre Haute, Ind.—City council authorized Jan. 25 the construction of 6 miles of cement walks in various portions of this city.

Grand Forks, N. D.—Plans will be submitted in February for paving several streets. The specifications include a number of materials.

Lagrange, Ga.—City council has decided to pave Ridley, Broad and Bull streets with brick and Greenville and Hines st. with Belgian blocks.

New Orleans, La.—The Capitol commission will soon take up the question of paving Capitol st. in front of the Governor's Mansion square with cement.

Athens, Ga.—The construction of 8,000 sq. yds. vitrified brick, 3,000 sq. yds. block and 7,000 sq. yds. macadam paving, is contemplated. J. W. Barnett, Cy. Engr.

Jacksonville, Ill.—This city contemplates over two miles of brick paving on concrete base, with concrete curb and gutter this spring. S. N. Stewart, Cy. Clk.

Decatur, Ill.—Bids will be asked for the latter part of March for 13,000 sq. yds. of brick paving in S. Oakland ave. and W. Macon st. A. B. Alexander, Cy. Engr.

Fremont, Nebr.—Will vote, Feb. 4, on the issue of $40,000 bonds for paving street intersections. Petitions for paving 20 blocks of streets have been granted.

Cincinnati, O.—A resolution has been prepared providing for the improvement of Burnet ave. in Avondale with granite and creosoted blocks. City Engineer Danenhower.

Norfolk, Va.—The city engineer has been asked to submit estimates for paving Monticello ave., from Banta st. to Armistead bridge with Belgian block, asphalt or other material.

New Albany, Ind.—The city engr., Samuel T. Mann, has been directed to prepare plans and specifications for paving Thomas st. from Spring to Market with vitrified brick.

Menominee, Mich.—The city engineer has been directed to prepare plans and specifications for paving Ogden st. with brick and Main st. the kind of material not decided upon.

Macomb, Ill.—This city contemplates constructing 11,700 sq. yds. of double course brick paving, 6,660 lin. ft. sandstone curbing and 40 lin. ft. wooden curbing. F. G. McClellan, Cy. Clk.

Troy, N. Y.—Ordinances have been approved for paving 8th st. from Congress to Fulton, with bitulithic and Broadway from 7th st. to Institute ave. with granite block. City Engineer Cary.

Washington, D. C.—Pennsylvania ave. from Four-and-a-half st., will be resurfaced, beginning the latter part of March, with sheet asphalt with 28 in. vitrified block gutters and granite curbing.

Saginaw, Mich.—The sum of $350,958.75 is needed for paving and repaving this year, according to estimates submitted by City Engineer Roberts and the joint committee of the board of public works, January 18.

Durham, N. C.—This city will ask legislature for permission to vote May 1 on the issue of $275,000 bonds for constructing streets in this city and $3,000,000 bonds for roads in Durben county. Gilbert C. White, Cy. Engr.

Poughkeepsie, N. Y.—A resolution has been adopted for repaving Main st., between Washington and N. Hamilton sts. Also to prepare a report on the present condition of several paved surfaces in the city and whether repairs are necessary.

Mishawaka, Ind.—The paving question is being agitated here and various opinions are expressed as to the best material to use. So far, brick is favored for Bridge and 1st sts. and asphalt for Mill and Church sts. The advocates for brick and asphalt for Main st. are about evenly divided.

South Milwaukee, Wis.—Special.—John Stuessi, st. comr., says this village contemplates paving from 8 to 12 blocks the coming season. A committee of five has been appointed to get the consent of the owners and to ascertain the best kind of material. Brick is favored by the majority.

CONTRACTS TO BE LET.

St. Louis, Mo.—Bids are asked until Feb. 8 for improving 52 alleys. B. P. I.

Corvallis, Ore.—Bids are asked until March 1 for improving 7 streets. Council St. Com.

Des Moines, Ia.—Bids are asked until Feb. 16 for paving W. 16th st. with brick. W. W. Wise, Chrm. B. P. W.

Ft Scott, Kas.—Bids are asked until Feb. 5 for curbing and macadamizing Holbrook st. J. O. Brown, Cy. Clk.

Logansport, Ind.—Bids are asked until Feb. 6 for constructing the Shanter gravel road. Geo. N. Cann, Co. Audt.

Cincinnati, O.—Bids are asked until Feb. 7 for macadamizing and curbing Stanley ave. M. J. Keefe, Clk. B. P. S.

Petersburg, Ind.—Sealed bids are asked until Feb. 5 for constructing certain roads. W. W. Shy, Chm. Co. Comrs.

Norwood, O.—Bids are asked until Feb. 2 for grading and macadamizing sundry avenues. L. H. Gebhart, Vil. Clk.

Greensburg, Ind.—Sealed bids are asked until Feb. 15 for constructing a gravel road in Fugit twp. Co. Comrs.

Neodesha, Kan.—Bids are asked until Feb. 14 for constructing brick paving and concrete curb. J. J. Carroll, Cy. Clk.

Des Moines, Ia.—Bids are asked until Dec. 6 for 1,219 ft. of Portland cement curb on W. 16th st. W. W. Wise, Chm. B. P. W.

Winchester, Ind.—Bids are asked until Feb. 5 for paving 51,820 ft. of roadways with crushed stone. Mack Pogue, Co. Audt.

Chagrin Falls, O.—Bids are asked until Feb. 18 for paving Franklin ave. and Orange st. with paving brick. H. D. Bishop, Vil. Clk.

Aberdeen, S. D.—Bids are asked until Feb. 25 for paving several streets with creosote blocks, brick or asphalt. F. W. Raymond, Cy. Audt.

Knox, Ind.—Sealed bids are asked until Feb. 7 for constructing 6,733 ft. of gravel road in Vincennes twp. Jno. T. Scott, Co. Audt.

Goshen, Ind.—Sealed bids are asked until March 4 for 6 blocks of brick paving with combination curb and gutter. C. C. Witt, Cy. Engr.

Bloomfield, Ind.—Bids are asked until Feb. 5 for constructing a gravel and macadamized road in Wright twp. Peter M. Cook, Co. Audt.

Cincinnati, O.—Bids are asked until Feb. 2 for macadamizing Rolston ave. and until Feb. 7 for 1,900 sq. yds. of paving on Stanley ave. B. P. S.

Denison, Tex.—Bids are asked until Feb. 7 for 20,000 sq. yds. of vitrified brick paving on Main st. R. I. Parks, Cy. Engr.; J. D. Yocum, Cy. Secy.

Corning, N. Y.—Sealed bids are asked until Feb. 28 for 17,705 sq. yds. of brick paving with cement curbs and gutters. J. T. Hall, Clk. B. P. W.

Somerville, N. J.—Sealed bids are asked until Feb. 5 for macadamizing 3.14 miles of road in Branchburg twp. Henry W. Baird, dir. bd. chosen freeholders.

Greencastle, Ind.—Sealed bids are asked until Feb. 4 for constructing 6,957 ft. of macadamized road in Jefferson twp. V. B. McCammack, Chm. Co. Comrs.

Valparaiso, Ind.—Bids are asked until March 8 for constructing combined cement curbing and gutters on Morgan, Michigan and Waters sts. Rob't Ewing, Cy. Clk.

La Porte, Ind.—Sealed bids are asked until Feb. 16 for constructing a macadamized road in Michigan twp. Henry C. Kruyer, Chrm. Co. Commis.; Chas. H. Miller, Co. Audt.

Columbus, O.—Bids are asked until Feb. 16 for constructing a road at Steubenville and until Feb. 18 for constructing one at Youngstown. Sam Houston, State Highway Commr.

New Orleans, La.—Bids are asked until Feb. 19 for constructing a small granite block pavement on the river front, from Biersville to Barracks st. Hugh McCloskey, Prest. Bd. Port Comis.

Monessen, Pa.—Sealed bids are asked until Feb. 25 for grading, curbing and paving 11,350 sq. yds. with vitrified brick, hillside brick or asphalt block. J. F. Irwin, Br. Engr.; J. J. Cushing, Chrm. St. and Rds. Com.

Brazil, Ind.—Bids are asked until Feb. 7 for constructing 11,910 ft. of gravel road in Posey twp. and 12,760 ft. in Sugar Ridge twp. Jas. L. Burns, Co. Audt.

Camden, N. J.—Sealed bids are asked until Feb. 13 for building a gravel road from Berlin to Melford, 4 5-10 miles. Alfred L. Sayres, dir. bd. chosen freeholders.

New York City.—Bids are asked until Feb. 6 for asphalt paving on concrete base, sidewalks, etc., on various streets in Brooklyn boro. Bird S. Coler, Prest. Boro.

Tulsa, I. T.—Sealed bids are asked until Feb. 15 for paving a number of streets with brick or asphalt on concrete, macadam or brick and sand base. W. D. Abbott, Cy. Recdr.

Bogota, N. J.—Sealed bids are asked until Feb. 12, for 9,200 sq. yds. of macadam paving; 10,500 lin. ft. of flag walks; 10,500 lin. ft. curbing; 1,950 sq. yds. gutters. Peter F. Hopper, Chm. St. Comrs.

Newburgh, N. Y.—Sealed bids are asked until Feb. 18 for paving 10,500 sq. yds. of N. Water st. and Lewy Place and 18,200 sq. yds. of Lander st. with vitrified brick, asphalt block or Warren's bitulithic paving with curbstones, catchbasins, sewer manholes, etc. D. J. Coutant, Cy. Clk.; Everett Garrison, Cy. Engr.

CONTRACTS AWARDED.

El Paso, Tex.—The contract for new paving was awarded to the Texas Bitulithic Co.

Vincennes, Ind.—Edward Pennington was awarded a contract for improving Locust st.

Cincinnati, O.—The contract for improving Charlotte st. was awarded to Em. Fogarty for $1,249.52.

Jacksonville, Fla.—The contract for paving various streets here was awarded to John N. C. Stockton.

Dayton, O.—The contract for paving various streets with asphalt was awarded to the Barber Asphalt Paving Co.

La Grange, Ga.—The Chattanooga Paving & Construction Co. was awarded the contract for paving for about $75,000.

Sunnyside, Wash.—The contract for constructing 10 miles of roadbed here was awarded to Thomas Dingle of this city.

Buffalo, N. Y.—Special.—The contract for paving Sobieski st. with brick from Sycamore st. to Walden ave. was awarded to F. V. Bardol for $9,670.

Franklin (New London P. O.), Conn.—The contract for constructing 3,000 ft. of gravel road on telford base was awarded to Wm. B. Wilcox of Norwich, Conn.

Philadelphia, Pa.—The contract for the maintenance of unpaved and macadamized public highways was awarded to David Peoples, Betz Bldg., city, for $144,000.

Cincinnati, O.—The Kirchner Construction Co. was the lowest bidder Jan. 15 for paving Bates st. between Central and Freeman aves. with asphalt at $19,578.30.

Enid, Okla.—The contract for constructing brick paving between the street rail-

way tracks was awarded to the Cleveland Trinidad Paving Co., of Cleveland, O.

Knoxville, Tenn.—Borches & Co. secured the contract Jan. 9 for 5,000 sq. yds. brick paving on all of the wagon ways around the freight depots and office buildings, and the work of construction has begun.

Rochester, N. Y.—Paving contracts have been awarded as follows: Tacoma st., asphalt, Whitmore, Rauber & Vicinus, 279 Smith ave., $4,701; Miller st., brick, H. B. Hooker & Son, Wilder Bldg., $13,401.

West Chester, Pa.—Dawson & Davis of this city were awarded the contract for constructing a macadamized road and building gutters and bridges on a section of public road leading from Devon Station to Valley Forge National Park, about 3 miles.

Steubenville, O.—H. M. Bates submitted the lowest bid for paving lower Washington st. as follows: Hillside paving block, $1.09 a sq. yd.; vitrified paving brick, 91 cts. a sq. yd.; new curbing, 50 cts. a lin. ft.; resetting old curbing, 18 cts. a lin. ft.

Buffalo, N. Y.—Special.—The contract for asphalting and repairing 66,415 sq. yds. of streets and roads for three years was awarded to the German Rock Asphalt & Cement Co., 305 D. S. Morgan Bldg., this city, as follows: First year, 15 cts. a sq. yd.; second year, 17 cts.; third year, 18½ cts.

Cleveland, O.—This city has awarded 23 paving contracts as follows: Michael Kavanagh, $1,533; Standard Paving Co., 9 contracts, $31,459; Baldwin Bros. & Graham, 3 contracts, $17,477; Cleveland Trinidad Paving Co., 2 contracts, $80,158; Roehl Bros., 5 contracts, $26,808; Northern Paving Co., 3 contracts, $26,246.

Mobile, Ala.—The contract for constructing 5,307 sq. yds. of bitulithic paving was awarded to the Southern Bitulithic Co., of Nashville, Tenn. This is in addition to a contract for 40,000 yds. recently awarded. Cafyen & Carter, of Rochester, N. Y., secured the contract for wooden block paving in Dauphen st. for $26,764.90.

Washington, D. C.—Martin McNamara was awarded a contract for constructing a standard asphalt block driveway and sidewalk at the new offices of the Norfolk & Washington Steamboat Co., at the foot of 7th st., this city, and for a similar driveway and sidewalks at the entrances to the office at the foot of Boston st., Norfolk, Va.

Springfield, Ill.—Paving contracts have been awarded as follows: Barber Asphalt Co., paving Park st. from Wayne to Ford, $29,510; paving Tecumseh st. from Sixth to Green, $3,568; paving Broadway from Wolf Creek to Lexington, $32,580, and J. E. Conley Co., paving Broadway from Fifth to Wolf Creek, $22,314; William McCarthy Co., laying sanitary sewer in District No. 4, bounded by Wayne, Wyoming, St. Paul, Pennsylvania tracks, Linden, Fifth and alley east of McReynolds and Richard, $57,792. The William McCarthy Co. assigned the sewer contract to Hoglen & Gephart.

Albany, N. Y.—Bids were submitted Jan. 21 for street improvements, as follows: For the improvement of Teunis st., from Second to Third aves., paving with vitrified blocks, etc.; John Doyle, Albany, $6,145; Edward F. Dilion, Albany, $6,309; Michael F. Dollard, Albany, $6,319; T. Henry Dumary, Albany, $6,146; Mulderry Bros., Albany, $5,829. For improvement of South Lansing st., from Broadway to Franklin st., paving with vitrified blocks, etc.; John Doyle, $10,824; Edward F. Dilion, $11,063; Michael F. Dollard, $10,997; T. Henry Dumary, $10,400; Mulderry Bros., $10,712. For furnishing ¾ and ½-inch trap-rock for the Bureau of Parks: Jacob E. Conklin, Rockland, N. Y., $1.25 and $1.50 per cu. yd. For furnishing gravel for Bureau of Parks: Jas. A. DeGroat, $1.50 per cu. yd.

Galveston, Tex.—The contract for improving 3 sections of the Galveston Lea Wall boulevard was awarded to Kelso & Vantran of this city as follows: Sec. 1: 23,180 sq. yds. brick pavement, $1.41; 350 lin. ft. retaining curb, 44 cts., and 50 lin. ft. railroad iron, 40 cts. Sec. 2: 9,084 lin. ft. concrete curb, 44 cts.; 9,985 sq. yds. concrete sidewalk, $1.19; and 650 lin. ft. vitr. pipe, 25 cts. Sec. 3: 5,293 lin. ft. iron posts and railing, 75 cts. Total of all three sections, $52,869. For Sec. 1 and 2, F. O. Brown, Dallas, bid $49,971 and Geo. E. Robertson, Galveston, $49,865. For Sec. 2, Edw. F. Drewery, Galveston, bid $16,012, and Edw. Ringh, Galveston, $15,831; and for Sec. 3, A. Fodder, Galveston, bid $6,312, and Texas Anchor & Fence Co., Ft. Worth, $3,837.

Auburn, N. Y.—Special.—J. Walter Ackerman, Cy. Engr., says bids were received Jan. 15 for paving Genesee st. The Warner-Quinlan Co., 438 S. Salina st., submitted the lowest bid for asphalt paving with Medina block, brick included, as follows: Mack block with Auburn grey limestone curbing, $75,056; with Medina sandstone curbing, $74,456; Metropolitan block, with Auburn grey limestone curbing, $75,056, with Medina sandstone curbing $74,096; with Berea sandstone curbing, $74,456; Pittsburg-Buffalo block with Auburn grey limestone curbing, $74,846; with Medina sandstone curbing, $73,886; with Berea sandstone curbing, $74,246; Brayer Bros. submitted the lowest bids on asphalt paving with Medina block, brick not included, as follows: With Auburn grey limestone curbing, $51,755; with Medina sandstone curbing $50,795; with Berea sandstone curbing, $50,555. The Barber Asphalt Paving Co. bids were high in each instance.

New York City.—Bids for paving South st. from Whitehall to Corlears sts. with granite blocks were received Jan. 9 as follows: Asphalt Construction Co., Broadway, $261,647; C. W. Collins, Fordham, $253,259; M. Baird Construction Co., 432 East 92d st., $249,873; M. Fitzgerald, 312 West 143d st., $265,316; Atlanta Construction Co., 432 East 91st st., $252,420; John M. Sheehan, $233,153; John E. Quinn, 466 East 15th st., Brooklyn, $237,861, and W. T. Fitzgerald, 539 West 45th st., $216,500. The following bids were also received at the same time for paving West st. from Battery Pl. to Gansevoort st. with granite blocks: W. J. Fitzgerald, 539 West 45th st., $224,225; John M. Sheehan, $245,031; United States & Venezuela Co., 1 Broadway, $254,067; Atlanta Construction Co., 432 East 91st st., $260,623; M. Fitzgerald, 312 West 143d st., $263,332; C. W. Collins, Fordham, $262,706; Asphalt Construction Co., 207 Broadway, $266,657; City Excavating & Construction Co., $296,331; M. Baird Construction Co., 432 East 92d st., $304,241, and T. V. Smith Construction Co., 147 East 125th st., $312,224.

SEWERS.

Clayton, Mo.—The Clayton Sanitary Co. has been organized to install sewer systems and septic tanks by B. C. Stevens,

Geo. W. Wolff, Peter Wetzel, Daniel Schmid and Theodore T. Bayer.

Shawnee, Okla.—The injunction brought by the Shawnee Sewerage and Drainage Co., to restrain the city council from selling $160,000 bonds for a sanitary sewer and water works extensions, has been set aside. Council will soon ratify the sale of the bonds to the Dallas Trust Co., and the contract for the sewer will be let soon.

CONTEMPLATED WORK.

Ida Grove, Ia.—A sewerage system is contemplated.

Brantford, Ont.—Voted in favor of sewer extensions.

Webster City, Ia.—A sewer on Walnut st. is proposed.

Rushville, Ind.—A local sewerage system is contemplated.

Napanee, Ont.—Voted to improve the sewerage system.

Livingston, Mont.—Plans have been accepted for a new sewer.

Baissevain, Man.—Plans for a sewerage system have been prepared.

South Shore, S. D.—The construction of sewers is contemplated.

Wetaskiwin, Alta.—Plans have been prepared for a sewerage system.

Waupaca, Wis.—Preliminary surveys are being made for a sewerage system.

Greentown, Ind.—The construction of a sewerage system is contemplated.

Renfrew, Ont.—Voted to issue $6,000 bonds for sewer extensions.

Woodstock, Ont.—Voted in issue $20,000 bonds for sewer extensions.

Tomah, Wis.—The question of constructing a sewerage system is being agitated.

Spokane, Wash.—A trunk sewer in the first ward at Union Park is proposed.

Vinton, Ia.—Surveys have been made for constructing a large main sewerage system.

Waterloo, Ont.—This town voted to issue $23,000 bonds for sewer farm improvements.

McMechan, W. Va.—Plans and specifications are being prepared for constructing sewers.

Linton, Ind.—The question of constructing a sewerage system is still under consideration.

Waco, N. C.—Voted to issue bonds for sewers.

Hamilton, O.—Resolutions have been passed to construct a number of sewers.

Jonesboro, Tenn.—The question of a sewerage and waterworks system is being urged.

Collingdale, Pa.—Will vote in February on the issue of bonds for constructing sewers.

Madison, Ga.—Will vote Feb. 20 on the issue of bonds for an up-to-date sewerage system.

Carlsbad, N. Mex.—The question of constructing a sewerage system is being considered.

Buffalo, N. Y.—Special.—Plan C for the abatement of South Buffalo floods will be urged.

Greentown, Ind.—The town bd. will ask for bids for constructing a sanitary sewerage system.

Wheeling, W. Va.—The town of Patterson has decided to issue bonds for constructing a sewerage system.

Montgomery City, Mo.—Town council will have surveys and estimates made for constructing sewers.

Joplin, Mo.—Ordinances were passed Jan. 15 providing for over 2 miles of sewers in various parts of this city.

Ford, Mich.—A bill has been introduced providing for the issue of bonds for establishing a sewerage system.

Fayetteville, Ark.—Plans and specifications for a sewerage system are being made by Burns & McDonnell of Kansas City, Mo.

New Castle, Del.—Plans are being prepared for constructing a sewerage and a drainage system.

Hamilton, O.—New sewers are contemplated in Park ave. and W. Hamilton st. A. L. Dillon, Cy. Engr.

Athens, Ga.—The construction of 1 mile of sanitary sewers is contemplated. J. W. Barnett, Cy Engr.

Detroit, Mich.—Plans are being prepared for a sewer in the 18th ward. Robt. H. McCormick, Cy. Engr.

Alexandria, La.—Will vote Feb. 18 on the issue of $16,000 bonds for extending the sewerage system.

Sterling, Ill.—Resolutions have been passed to construct the Summit and East End sewer systems.

Hamilton, Ont.—Voted Jan. 7 to construct sewers in the annex and an intercepting plant to cost $120,000.

Pana, Ill.—City council granted a petition January 16 for extending the sewerage system through West Pana.

Marseilles, Ill.—A petition is being circulated for constructing a sewerage system at a cost of $100,000.

Springfield, O.—Will construct 66 short sewers to connect with the present system. W. H. Sieverling, Cy. Engr.

Baltimore, Md.—Plans for a new sewage pumping station will be prepared by Henry Brauns, 320 N. Charles st.

Aberdeen, Wash.—Bids will be received about March 1 for constructing 6 miles of sewers. H. W. Troutman, Cy. Engr.

Rochester, N. Y.—An ordinance was passed Jan. 8 for constructing a sewer on Monroe ave. from Field st to Rosedale ave.

York, Pa.—An ordinance has been passed providing for a bond issue for the purpose of completing a sewerage system.

West Allis, Wis.—Plans for a septic tank sewerage system have been filed with the city clerk by Fred Schneider, Cy. Engr.

Aberdeen, Wash.—Plans for an extension to the sewerage system about 6 miles in length are being made. H. W. Troutman, Cy. Engr.

Sioux Falls, S. D.—The question of constructing sewerage is being agitated and authority may be secured from the legislature.

Toledo, O.—An ordinance has been passed to issue $40,000 bonds for constructing sewers in various streets. Peter Witt, Cy. Clk.

Cambridge, O.—Bids will be asked soon for constructing 7,000 ft. of 12 in. and 4,000 ft. of 8 in. pipe sewer. D. M. Hoge, Cy. Engr.

Easton, O.—Plans are being prepared by L. Reid, Cy. Engr., for a sewerage system and the question will be voted on in the spring.

Scottdale, Pa.—Will issue bonds for completing the sewer system and to pay off the floating indebtedness. L. R. Eicher, Chm. Sewer Com.

Stillwater, Minn.—Special.—Lewis W. Clarke, Room 10, Mower Block, advises us that he desires to purchase sewer, waterworks and grading tools.

New Philadelphia, Pa.—Bids will be asked soon for constructing a 10 to 20-in. vitrified pipe sewer system. Geo. Williams, Secy. B. P. S.

Massillon, O.—Bids will be asked in the spring for constructing sanitary sewers in Center st. and Woodland ave. Harold Howald, Cy. Engr.

Oshkosh, Wis.—A final hearing will be held Feb. 10 on the proposed relief sewer

on Osceola, Algoma, Elm, Irving, Wisconsin and other streets.

Shelbyville, Ky.—The question of constructing a sewerage system is under consideration and council desires engineers to submit plans and estimates.

Sydney Mines, N. S., Canada.—Tenders will be received in the spring for the balance of the proposed sewer system. J. G. Campbell, Town Engr.

Beverly, N. J.—J. Erwin Halpot and associates of Philadelphia have made application for permission to construct a sewerage system in this city.

Sulphur, I. T.—A geological survey is being made for a sewer system for Platt National Park. This city's sewers will be connected with the system.

Winchester, Ky.—Dr. J. L. Webber is chairman of the sewer commission which will have charge of constructing the proposed sewers and septic disposal plant.

Collinsville, Ill.—Jos. Klusner is chairman of a committee to consider the advisability of constructing a sewerage system. W. H. Matthews, Mayor.

Columbus, O.—Ordinances authorizing an issue of $250,000 bonds for the water department and $100,000 for the sewerage disposal plant, have been recommended.

Trenton, N. J.—The special committee appointed to devise a method to prevent the pollution of Delaware River and to suggest plans for the construction and maintenance of a sewerage disposal plant for this city was organized Jan. 9 with John O. Gulton as chairman.

Crown Point, Ind.—The town board is considering the employment of an engineer to prepare plans, estimates, etc., for a sewerage system. John E. Luther, Prest.

Chillicothe, O.—Plans and estimates have been approved for 6,500 ft. 8 and 10-in. sanitary pipe sewer laterals to be constructed in sundry streets. H. M. Redd, Cy. Engr.

Bradford, Pa.—The estimated cost of constructing a surface sewer in Corydon street is $2,284; building a flood wall in the Fourth ward, $1,835,737; sewer in Congress street, $5,116.25. E. Bannon, Cy. Engr.

Durham, N. C.—Permission will be asked of the legislature to vote May 1 on issuing $275,000 bonds for extending the sewerage system and constructing an additional sewage disposal plant. Gilbert C. White, Cy. Engr.

Des Moines, Ia.—Sewer work in this city is contemplated as follows: Grand View system, 6 miles; West End extension of Ingersoll Run sewer 2 miles; Southwest system, 2 miles; 24th street branch of Ingersoll Run sewer, 1½ miles. Geo. Dobson, Cy. Engr.

St. Louis, Mo.—Ordinances were approved Jan. 11 for constructing sewers as follows: Extending Harlem Creek sewer and authorizing an appropriation of $225,000 for its construction, which will require 2,300 additional ft. of sewer in Bircher st., from a point 600 ft. west of Broadway, to the upper intersection of Florisant ave. and Bircher st. The sewer is to be of reinforced concrete, 17 by 25 ft. in size; also the 7th st. deep-drainage sewer, for which an appropriation of $50,000 is asked. This will vary in size from 3 and 4 ft. deep to 6 ft. wide. It will extend from Biddle st. to Washington ave., and is to empty into the Biddle sewer, and for Rocky Branch sewer No. 14, draining the territory bet. Taylor, Newstead and Ashland ave. and the Natural Bridge Road at a cost of $6,500, and will be from 12 to 18 in. in diam.

CONTRACTS TO BE LET.

Bruce, Wis.—Bids are asked until Feb. 15 for constructing sewers. Archie Taylor, Cy. Clk.

Massillon, O.—Bids are asked until March 1 for building a sewer. H. L. Leahy, chm. B. P. S.

Toledo, O.—Bids are asked until April 1 for constructing a sewer system. F. I. Consaul, Cy. Engr.

Cincinnati, O.—Bids are asked until Feb. 17 for constructing 1606 ft. pipe sewers. C. J. Danenhower, Cy. Engr.

Ft. Dodge, Ia.—Bids are asked until Feb. 21 for constructing drain Nos. 1, 7, 17, 24 and 28. H. S. Holm, Co. Audt.

Cincinnati, O.—Bids are asked until Feb. 7 for constructing sewers and drains in Beechmont ave. M. J. Keefe, Clk. B. P. S.

New York City.—Bids are asked until Feb. 4 for constructing a sewer and appurtenances in 125th st. John F. Ahearn, Prest. Manhattan boro.

Burlington, Ia.—Sealed bids are asked until March 18 for constructing a vitrified pipe sewer and branches. J. F. Winters, Cy. Engr.

Cairo, Ill.—Bids are asked until Feb. 19 for constructing 9,699 ft. of concrete main sewers and appurtenances. Wilbur B. Thistlewood, Cy. Engr.

Charleston, W. Va.—Bids are asked until Feb. 16 for constructing 7 miles of terra cotta pipe, reinforced concrete and brick sewers. E. R. Hood, Cy. Recdr.

Crookston, Minn.—Bids are asked until Feb. 12 for building 3,795 ft. 30, 24, 15 and 9-in. sewers, with Y's, manholes and catchbasins. J. E. Carroll, Cy. Engr.

St. Paul, Minn.—Bids are asked until Feb. 4 for building 6 sewers on Weide, Hawthorne and Payne aves. and Edgerton st. B. P. W.

Carthage, Mo.—Bids are asked until Feb. 1 for constructing 410 ft. 10-in. and 3,800 ft. 8-in. vitrified pipe sewers. Wm. Kohlman, Cy. Engr.

Camden, N. J.—Sealed bids are asked until Feb. 5 for constructing a sewer on Princess ave. Edward Francis, Chrm. Com. on Sts. and Highways.

Cape Girardeau, Mo.—Sealed bids are asked until Feb. 4 for constructing a sewerage system in sewer district No. 1. Wm. H. Caryer, Mayor; Geo. E. Chappell, Cy. Clk.

Dubuque, Ia.—Bids are asked until March 1 for constructing 1,400 ft. of concrete storm sewer; 1,000 ft. of sanitary sewer in W. Locust st. Edmund A. Linehan, Cy. Recdr.

Williston, N. D.—Bids are asked until March 5 for constructing canals and ditches involving 420,000 cu. yds. earth excavation; pumping station and various structures requiring 1,300 cu. yds. concrete, 10,000 lbs. structural steel, 120,000 ft. B. M. lumber. H. A. Storrs, Elec. Engr., Williston.

Decatur, Ill.—Sealed bids are asked until Feb. 14 for constructing the Prairie ave. sewerage system, involving 3,148 ft. of 48-in. concrete sewer; 24,827 ft. 42, 24, 20, 18, 15, 12, 10 and 8-in. vitrified pipe sewer; Y-Junctions, T's, 42 manholes, 42 catchbasins, 22 lampholes, 38,000 cu. yds. earth exca.; also constructing 1,010 ft. 54-in. cement sewer in Cantrell st. sewer dist. G. W. Lehman, Mayor; Albert Leach, Cy. Clk.

CONTRACTS AWARDED.

Racine, Wis.—The contract for building a sewer in 16th st. was awarded to Andrew Thompson.

Lorain, O.—Glover & Burke secured the contract for constructing a sewer in Penfield ave. for $5,102.

Clinton, Ia.—The Peoples Construction Co. was awarded the contract for constructing new sewers.

Kankakee, Ill.—The contract for constructing sewers in East and Schuyler aves. was awarded to McMullen & Mann.

Merchantsville, N. J.—The contract for constructing sanitary sewers was awarded to S. Hewitt & Co. of New York City.

Little Rock, Ark.—The contract for constructing sewers in district 43 has been awarded to Joseph McCoppin for $10,455.

San Francisco, Cal.—The Burrell Construction Co. of this city was awarded the contract for new sewers in Market st.

Dayton, O.—The T. J. Backus Construction Co. was awarded a contract for constructing sanitary sewers in various streets.

Argenta, Ark.—The contract for constructing a general sewer system was awarded Jan. 10 to the Nick Peay Construction Co. of Little Rock for $64,400.

Buffalo, N. Y.—Special.—The contract for constructing a 12-in. tile sewer on Margaret st. between Robert and Curtis sts. has been awarded to Geo. W. Moore for $1,346.

New Albany, Ind.—The contract for constructing a sewer in Culbertson ave. was awarded Jan. 9 to the Marion County Construction Co. of Indianapolis for $1,763.88.

Kansas City, Mo.—The Parker-Washington Co. submitted the lowest bid Jan. 3 for constructing joint district sewers as follows: 402 lin. ft. 10-in. sewer pipe, $1.50; 582 lin. ft. 28-in. brick sewer, $4; 103 lin. ft. 30-in. brick sewer, $5.60; 958 lin. ft. 40-in. brick sewer, $7.75; 70 lin. ft. 15 and 12-in pipe connections, $2; 200 lin. ft. 15-in. basin pipe, $1.50; 14 catch basins and manholes, each $40; and 2 special connections, $300; total, $12,532.

Merchantsville, N. J.—Special.—The contract for constructing sewers was awarded Jan. 15 to Stevens, Hewitt & Co., of New York City, for $29,200.06.

Oakland, Cal.—Bids were submitted Jan. 2 for constructing sewers and the contracts awarded as follows: C. D. Vincent, 269 10th st., brick sewer in sundry streets, $52,710 and $62,205. Contra Costa Construction Co., concrete sewer in Adeline st., $17,584. Wm. Healy, 466 24th st., ironstone pipe sewer in San Pablo ave., $11,659. Atlantic Gulf & Pacific Co., San Francisco, concrete main sewer, $95,645. Jas. A. McMahon, 6 California st., San Francisco, concrete outlet sewer, $39,555.

WATER WORKS.

Muskegon Heights, Mich.—The new waterworks system will be ready for operation Feb. 1. Cy. Engr. Hosner.

Columbia, S. C.—The old waterworks plant was sold Jan. 15 by this city to J. W. Miller, of Boston, for $1,000. The plant included 2 old pumps and fittings, 2 parts of flumes, 8 beams, 700 feet of cast-iron piping and about 1,000 pounds of old brass fittings. The new plant was put in operation about Jan. 1, 1907.

Ithaca, N. Y.—The terms of the decision of the commissioners in appraisal of the suit over municipal ownership of the waterworks system of this city were made public December 28. By the terms the city is to pay the old water company $660,000 with interest from Jan. 1, 1905. The decision is in favor of the waterworks company, which offered to sell for $605,000. The city's offer was $450,000.

CONTEMPLATED WORK.

Rockville, Conn.—Plans have been prepared for a new filtration plant.

Phelps, N. Y.—Will vote on repairing and improving the waterworks system.

Appleton, Wis.—Plans are being prepared for a municipal waterworks system.

Liberal, Kan.—T. J. McDermott is preparing to establish a private water plant.

Mineola, L. I., N. Y.—Voted to issue bonds for establishing a water supply system.

Allegheny, Pa.—Ordinance passed to issue $1,000,000 bonds for waterworks improvements.

Manitowoc, Wis.—Council will secure plans and estimates for a new waterworks system.

Newton, Va.—The proposed water supply system will cost about $30,000. J. L. Lyons, Mayor.

Duluth, Minn.—The estimated cost of a waterworks system for hillside district is $150,000.

Wetaskiwin, Alta.—Plans for installing a waterworks and sewerage system have been prepared.

Alexandria, La.—Will vote Feb. 18 on the issue of $7,000 for extending the waterworks system.

Boissevain, Man.—Plans for a waterworks and sewerage system have been completed. A. R. Welch interested.

Atlanta, Ga.—The question of issuing bonds for improving the waterworks system will be voted on March 5.

Montevideo, Minn.—Voted to issue bonds for a new steel water tower and reservoir and extending the water mains.

Pella, Ia.—Petitions are being circulated asking that the question of waterworks extension be voted on.

Wareham, Mass.—John O. Makepeace is chairman of a committee to consider the question of establishing waterworks.

Parrsboro, N. S.—Bids will probably be asked in March for extending the water-supply system. W. B. King, Town Clk.

Lewiston, Ida.—About $50,000 will be expended in enlarging the waterworks and installing meters. W. A. Smith, Supt.

Chattanooga, Tenn.—The Manufacturers' Association has declared in favor of municipal ownership of the waterworks plant.

Dallas, Tex.—A bond issue of $500,000 will probably be voted on in April for an adequate water supply for this city.

Toledo, O.—Bids will probably be asked in February for 2 water tube boilers, with stokers and all steam pipe complete.

Sarcoxie, Mo.—Plans and specifications for a waterworks system will be prepared by Burns & McDonnell, of Kansas City, Mo.

Waterville, N. Y.—Bids will probably be asked in March for constructing a reservoir. Blair Brook, Clk. Bd. Water Commis.

Fayetteville, Ark.—Council has authorized the issue of $150,000 bonds to purchase the water plant and make improvements.

Centralia, Mo.—Plans, specifications and estimates for waterworks and sewers will be made by Burns & McDonnell, of Kansas City.

Lima, O.—Special.—This city has engaged John W. Hill, of Cincinnati, as consulting engineer for the improvement of the water supply.

Eau Claire, Wis.—A resolution has been introduced authorizing an appropriation of $100,000 for the purchase of the waterworks system.

Lafayette, Ind.—J. F. Alexander & Sons of this city are engineers for the pro-

posed water system to be constructed at the county asylum.

Minneapolis, Minn.—J. H. McConnell, Supt. W. W., estimates that 62,000 ft. c. i. water pipe will be needed for the proposed extensions this year.

Stillwater, Minn.—Special.—Lewis W. Clarke, Rm. 10 Mower Blk., desires to purchase machinery and tools for pumping waterworks, sewer, grading, etc.

Hopeville, N. J.—Voted to issue bonds and contracts will probably be let in April for new reservoir, etc. C. H. Blackwell, Chrm. Water Com.

San Francisco, Cal.—In his annual report, Capt. Payson, prest. Spring Valley Water Co., advocates an independent system to supply water for fire protection.

La Grande, Ore.—A report was submitted to city council Jan. 10 on the cost of the proposed water supply from Beaver Creek. The question will be voted on.

North Tonawanda, N. Y.—Mayor De Kleist, in his annual message, has recommended that the water mains of the twin cities be connected for greater fire protection.

Springfield, Ill.—Joint committee on waterworks has decided in favor of the plans of City Engineer Hamilton for a new dam across the Sagamore River at the waterworks.

Northport, Mich.—Village bd. has appropriated $10,000 for establishing municipal waterworks and electric light plants. C. E. Kehl, J. H. S. Lutig, S. W. Porter Com.

Summerside, P. E. I.—Bids will probably be asked in February or March for constructing a waterworks and sewerage system. Jas. A. McNutt, Chrm. Water and Sewerage Com.

The question of building waterworks has been favorably voted on at as follows: Deer River, Minn.; Kenton, Okla.; Pawnee, Okla.; Newton, Miss.; Adel, Ga.; Tilden, Neb.; Leeds, N. D.

Bristol, Tenn.—A bill has been introduced in legislature asking for permission to issue $300,000 bonds to purchase the waterworks system and extend the mains for a gravity system.

Portland, Ore.—Plans have been submitted for installing an electric pump for elevating water to heights, constructing second pipe line and reservoir. Frank T. Dodge, Supt. Water Bd.

Painesville, O.—A resolution has been passed directing the board of public service to have plans and specifications prepared for a new water main from the pumping station to this city.

Waukegan, Ill.—John Erickson, of Chicago, has been engaged as consulting engineer to assist City Engineer Miller and the council in experimenting on the best plan to secure a pure water supply.

Harrisburg, Pa.—J. H. Fuertes, consulting engineer of New York City, has submitted to the water commissioners a report recommending changes in the water system. The cost will be from $140,000 to $200,000, according to the location of the pumping plant.

Covington, Ky.—Surveys and estimates for an increased water supply to include repairs to pumping machinery at Ft. Thomas pumping station and the construction of an emergency reservoir in Kenton county near Covington will be made by Geo. Horning of Cincinnati.

The question of issuing bonds for the construction of waterworks systems will be voted on at the following places: Missoula, Mont., Feb. 9; New Hampton, Ia.; Papillion, Neb.; Bode, Ia., March; Jefferson, O., Feb. 16; Tilden, Neb.; Mineral, Kan.: Big Timber, Mont., Feb. 2; Port Angeles, Wash.

Clarksburg, W. Va.—Special.—This city has retained John W. Hill of Cincinnati as consulting engineer to submit a plan and report on the general improvement of the waterworks system. This plant was built under the supervision of Mr. Hill about eighteen or nineteen years ago, at a time when the population was one-fifth of what it is now.

The construction of waterworks systems is contemplated by the following cities and towns: Halbur, Ia.; Bloomington, Neb.; Bottineau, N. D.; Dodge Center, Minn.; Bear Creek, Mont.; Belle Fourche, S. D.; Gibbon, Minn.; West Branch, Mich.; Follansbee, O.; Hoosick Falls, N. Y.; Newton, Miss.; Lewisburg, Tenn.; Billings, Mont.; Elwood, Neb.; Sauk Rapids, Minn.; St. Hilaire, Minn.

CONTRACTS TO BE LET.

Minneapolis, Minn.—Bids are asked until Feb. 8 for 500 ⅝ and 2-in. water meters. Cy. Clk.

Bruce, Wis.—Bids are asked until Feb. 15 for constructing a waterworks system. Archie Taylor, Cy. Clk.

Pinckneyville, Ill.—Bids are asked until Feb. 15 for constructing 2 steel water towers. W. W. Burk, Cy. Clk.

Waterbury, Conn.—Bids are asked until Feb. 12 for extending high pressure service. Robt. A. Cairns, Cy. Engr.

Parral, Mex.—Bids are asked until Feb. 28 for 300 water meters for first installations. Junta de Mejoras Materiales.

Washington, D. C.—Sealed bids are asked until March 2 for furnishing fire hydrants. H. B. F. McFarland, Chrm. Dist. Com.

Ft. Wayne, Ind.—Bids are asked until Feb. 14 for lining the waterworks reservoir with reinforced concrete. Bd. of Pub. Wks.

Jacksonville, Fla.—Bids are asked until Feb. 4 for furnishing 2 water tube boilers and appurtenances. R. N. Ellis, Supt. W. W.

Winnipeg, Man.—Bids are asked until March 1 for furnishing water pipe, specials, manholes, valves, etc. H. N. Ruttan, Cy. Engr.

Cincinnati, O.—Bids are asked until Feb. 7 for extending the water supply of Branch City Hospital. M. J. Keefe, Clk. B. P. S.

Oswego, Kan.—Bids are asked until Feb. 19 for steam pumps, boilers, reservoirs and buildings. Judge Nelson Case, Chrm. Water Com.

Philadelphia, Pa.—Bids are asked until Feb. 5 for boiler equipment for Lardner's Point pumping station No. 3. John R. Hathaway, Dir. Pub. Wks.

Winnipeg, Man.—Bids are asked until Feb. 6 for furnishing 4,500 ½-inch, 150 ¾-inch, 125 1-inch and 25 2-inch water meters. M. Peterson, Secy.

Yonkers, N. Y.—Bids are asked until Feb. 7 for furnishing and erecting a boiler plant and c. i. pipe. John J. Devitt, Prest. Bd. Water Commis.

Washington, D. C.—Bids are asked until March 12 for constructing 185 miles of canals, involving 900,000 cu. yds. exca., etc. E. A. Hitchcock, Secy U. S. Recla. Service.

Bloomington, Ill.—Bids are asked until Feb. 8 for furnishing 8,761 ft. of 18, 16, 12, 10 and 6-inch pipe, with valves, hydrants, etc. Elmer Folsom, Cy. Engr.

Walnut Hills, Ark.—Sealed bids are asked until Feb. 11 for constructing 500,000 cu. yds. of enlargement and new levee work. W. R. Salmon, Prest. Long Prairie Levee Dist.

Milaca, Minn.—Sealed bids are asked until Feb. 14 for constructing and erecting a steel water tank and tower. Rolleff Vaaler, Vil. Recdr.; Duluth Engr. Co., Engrs., Duluth.

St. Cloud, Minn.—Bids are asked until Feb. 4 for furnishing 1½ tons of 12-inch c. i. water pipe, 7 tons special castings, 21 tons small pipe, hydrants and valves. H. J. Limperich, Cy. Clk.

Washington, D. C.—Bids are asked until Feb. 9 for furnishing c. i. water pipe specials. Bids are asked until Feb. 2 for furnishing 3, 4, 6 and 12-inch c. i. water pipe. H. B. F. McFarland, Chrm. Dist. Commis.

Crawford, Neb.—Bids are asked until Feb. 27 for building Pathfinder Dike about 45 miles southwest of Casper, Wyo., involving 170,000 cu. yds. earth excavation and 16,000 cu. yds. riprap. U. S. Reclamation Service.

Mt. Pleasant, Mich.—Bids are asked until Feb. 20 for constructing concrete head wall, head gate, conduits, penstock, discharge pit, tail race, and power house; constructing reservoir and section pipe. M. Devereaux, Prest. B. P. W.

New York, N. Y.—Bids are asked until Feb. 6 for furnishing and delivering c. i. water pipe, branch pipe and special castings. Also for furnishing and laying water mains in a number of streets and furnishing corporation cocks and iron castings in Brooklyn. John H. O'Brien, Comr. Water Supt.

Williston, N. D.—Bids are asked until March 5 for constructing canals and ditches involving 420,000 cu. yds. earth, pumping station and various structures, 120,000 ft. B. M. lumber, 1,300 cu. yds. concrete and 10,000 lbs. structural steel, in connection with the Buford-Tranton project. H. A. Storrs, Elec. Engr.

CONTRACTS AWARDED.

Juneau, Wis.—The contract for furnishing c. i. ppe was awarded to the Massillon Iron & Steel Co., of Massillon, Ohio, at $39.60 per ton for 4-inch and $38.60 per ton for 6 and 8-inch pipe.

Pinesville, La.—The contract for constructing waterworks was awarded to the Orleans Engineering Co., of New Orleans.

Tacoma, Wash.—George Milton Savage has been awarded the contract for constructing water mains in Dist. No. 507 for $13,887.

McComb, Miss.—The contract for extending the water mains 8,000 ft. was awarded to P. H. Porter of Kentucky at 71 cts. a ft.

Norton, Va.—The Clear Creek Water Co., Big Stone Gap, Va., has been granted a franchise for constructing a water supply system.

Lima, O.—The contract for laying about 2,300 ft. 24-inch c. i. pipe was awarded, Jan. 15, to the Stone Construction Co. of this city for $6,235.

Melrose, Mass.—The contract for furnishing this city with 4 to 12-in. c. i. water pipe was awarded to F. A. Hondlette & Son, 93 Broad st., Boston.

Newburyport, Mass.—M. J. Drummond & Co., 182 Broadway, New York City, was awarded the contract for furnishing about 2 miles of 6 to 14-in. water pipe at $33.80 per ton.

Portland, Ore.—The contract for furnishing 1,800,000 lbs. of steel bars for reinforcing concrete in connection with the Tieton project, Wash., was awarded to the Expanded Metal & Corrugated Bar Co., of St. Louis, for $38,316.

Buffalo, N. Y.—Special.—The contract for constructing a second pumping station at the foot of Porter ave., a tunnel from there to an intake at the western end of the reef lying alongside the Emerald channel, and other work, was awarded to the Buffalo Dredging Co. for $1,272,763.73. The work is known as the Wards-Symon plan. The contract for a vertical turbine pump of not less than 25,000,000 gals., a capacity per 24 hrs. against a 200-ft. head was awarded to the Snow Steam Pump Works for $30,490.

Lockport, N. Y.—Special.—The contract for constructing the new waterworks system was awarded at a total cost of $486,598 as follows: For building pumping station complete, including foundations, C. N. Stainthorpe & Co., of Lockport, for $20,008; furnishing three Holly engines, capacity of 5,000,000 gallons each, C. N. Stainthorpe & Co., for $11,970; furnishing electric driving power for pumps, Stainthorpe & Co., for $19,525; furnishing stack and boilers for pumping station, Stainthorpe & Co., for $28,000; for intake crib ($11,000); pipes from crib to pump well ($56,400); pump well ($12,400), total, $79,800, to Buffalo Dredging Co.; thirteen miles of steel pipe, P. A. Gillespie Co., of New York City, for $340,000; standpipes, Walsh Steam Boiler Works of Holyoke, Mass., for $15,495.

BRIDGES.

Porterville, Cal.—Bids are asked until Feb. 17 for constructing a steel bridge. Robt. Hoebach, Cy. Clk.

Millen, Ga.—Bids will probably be received in March for bridge work. J. P. Applewhite, Chrm. Co. Commis.

Muscatine, Ia.—Bids are asked until Feb. 5 for furnishing steel bridges for the ensuing year. Bd. Co. Commis.

Cullman, Ala.—Bids are asked until Feb. 14 for building a steel bridge over Eight Mile Creek. Court of Co. Commis.

Lincoln, Neb.—Bids are asked until Feb. 5 for constructing all bridges during the year. W. L. Dawson, Co. Clk.

Van Buren, Mo.—The construction of an international bridge 1,000 ft. long over St. John River is contemplated here.

Fort Smith, Ark.—J. W. Carter proposes to establish and operate a free pontoon bridge across the Poteau for $4,500.

Princeton, Ind.—Bids are asked until Feb. 5 for furnishing and erecting 19 bridges. Harry R. Embree, Co. Audt.

Norwood, O.—City council is considering the issue of $105,000 bonds for erecting a viaduct over Marion and Section aves.

Emmetsburg, Ia.—Bids are asked until Feb. 5 for constructing all county bridges during 1907. Sim R. Stedman, Co. Audt.

Wauwatosa, Wis.—The question of constructing a foot and wagon viaduct here to cross the Milwaukee tracks is being revived.

Aberdeen, S. D.—Bids are asked until Feb. 6 for constructing a steel bridge across James River. D. C. Washburn, Cy. Engr.

Daggett, Cal.—Bids are asked until Feb. 25 for constructing a bridge across Mojare River, ½ mile from here. L. A. Pfeiffer, Co. Clk.

Lafayette, La.—Bids are asked until Feb. 7 for constructing an iron drawbridge about eight miles from here. Felix H. Mouton, Clk. Police Jury.

Oak Park, Ill.—This city will ask the county commissioners to aid in building a new concrete bridge across the Desplaines River at Lake st.

Kansas City, Mo.—The Union Bridge & Construction Co. has been incorporated by L. S. Stewart, Lee Treadwell, Clarence A. Neal and others.

Cincinnati, O.—Bids are asked until Feb. 15 for new woodwork on iron bridge over Little Miami River at Loveland, Symmes twp. Fred Driehs, Clk. Co. Commis.

Hammond, Ind.—Bids are asked until Feb. 8 for constructing 3 bascule bridges here. C. W. Hotchkiss, Genl. Mgr. Chic., Ind. & Southern R. R. Co., Chicago.

Farmersville, O.—The county commissioners will consider, Feb. 14, the question of constructing a 300-ft. steel bridge over Big Twin Creek, south of this city.

Jersey City, N. J.—Bids will be asked soon for building a new viaduct from Hoboken to Jersey City Heights. Jas. W. Lealey, Fuller Bldg., Jersey City, Engr.

Brainerd, Minn.—Bids are asked until Feb. 5 for constructing a bridge across Pine River at Madison and one across Pine River in Twp. 136. J. F. Smart, Co. Audt.

Venice, Ill.—The St. Louis Electric Bridge Co. has been incorporated to build a bridge across the Mississippi River, by W. H. Burke, G. A. Wright and Geo. M. Mattis.

Birmingham, Ala.—Bids are asked until Feb. 5 for erecting 12 new steel bridges and replacing wooden joists and handrail with steel on 6 bridges. P. S. Miller, Co. Engr.

Gadsden, Ala.—The contract for constructing an approach to the east side of Coosa River bridge was awarded to the Converse Bridge Co., of Chattanooga, for $5,075.

Williamson, W. Va.—Bids are asked until March 15 for constructing a steel railroad bridge over Laurel fork of Pigeon River. Henry M. Paine, Ch. Engr., Mingo Coal Co., Williamson.

Webster, Pa.—Bids are asked until Feb. 19 for constructing a joint bridge across the Monongahela River between Webster and Donova. A. H. Nelson, Engr., 1103 Manhattan Bldg., Pittsburg.

Kokomo, Ind.—The county commissioners and this city contemplate building a concrete arch bridge across Pete's Run in Palmer st. Bids will be asked as soon as the plans are completed.

Rock Island, Ill.—Bids are asked until Feb. 12 for rebuilding the United States bridge and viaduct between this city and the Rock Island Arsenal. Col. S. E. Blunt, Ordnance Dept., U. S. A., Rock Island Arsenal.

Knoxville, Tenn.—W. C. Crozer, Cy. Engr., has recommended that the Asylum ave. bridge be taken down and a concrete structure erected in its place. He estimates the cost of repairing the 27 bridges in this city at $20,000.

Salinas, Cal.—Bids are asked until Feb. 5 for building bridges at once, as follows: One 1,004 feet long at Chualor, of which 500 feet consists of Pratt trusses, the remainder being pile trestle; one at the San Ardo, 1,880 feet long, of which 1,100 feet are trusses, the remainder approach. L. G. Hare, Co. Surv.

STREET LIGHTING.

De Soto, Mo.—A gas plant will be erected here by Chas. A. McGee of St. Louis.

Mangum, Okla.—Will vote Feb. 3 on the issue of $30,000 for an electric light plant.

Ashland, Wis.—Voted Jan. 15 to issue bonds for a municipal gas and electric light plant.

Citronelle, Ala.—Voted to issue bonds for erecting an electric light plant. C. W. Thomas, Town Clk.

Readsville, Wis.—Will vote soon on the issue of bonds for constructing an electric light plant.

East Liverpool, O.—Mayor F. H. Waldron has been directed to start legislation for a municipal light plant.

Milwaukee, Wis.—Council directed the board of public works, Jan. 21, to advertise for bids for gas lighting for three years.

Pennsburg, Pa.—An ordinance has passed final reading providing for the issue of bonds for building an electric light plant.

South Sharon, Pa.—Will vote March 26 on the question of issuing $45,000 bonds for erecting a municipal electric light plant.

East Liverpool, O.—Sealed bids are asked until Feb. 8 for furnishing electric light for 5 or 10 years. J. W. Gipner, Secy B. P. S.

Natchez, Miss.—Sealed bids are asked until March 7 for lighting this city for 10 years. Geo. T. Eisele, Cy. Clk.; S. B. Stewart, Chrm. Lights and Water Com.

South Bend, Ind.—The South Bend Electric Co. contemplates improving its plant by replacing the engines with steam turbines. L. P. Andrus, Supt.

Northport, Mich.—Bids are asked until Feb. 10 for constructing an electric light and waterworks plant. Chris B. Kehl, Prest. Water and Light Com.

Jacksonville, Fla.—Bids are asked until Feb. 4 for erecting a chimney at the city electric light station. R. N. Ellis, Supt.; B. F. Dillon, Chrm. W. W. Trustees.

Peoria, Ill.—The Peoria Gas & Electric Co. contemplates an expenditure of $1,000,000 in enlarging and improving its system. R. L. Wallace, Supt. and Chief Engr.

Mobile, Ala.—Bids are asked until Feb. 4 for a complete conduit installation for low tension electric lighting at the new jail building. Bd. Revenue and Rd. Commis.

Winsted, Conn.—The Winsted Gas Co. has decided to increase its capital from $25,000 to $175,000 and make extensive improvements to the gas and electric plants.

West Monroe, La.—City council authorized, Jan. 8, Mayor R. L. Rinehart to secure the services of an engineer to survey the town for installing an electric light plant.

Bangor, Me.—Plans are being prepared by the Bangor Ry. & Electric Co. for the construction of the dam and power house which will be erected on the Union River at Ellsworth Falls.

Tama, Ia.—Will vote Feb. 4 on the issue of $10,000 bonds for erecting, equipping, maintaining and operating a municipal electric light plant. E. G. Penrose, Mayor; H. J. Ferguson, Cy. Clk.

Niagara Falls, N. Y.—Council has adopted a resolution according to press reports, providing for the investigation of the cost of constructing and maintaining a municipal electric light plant.

Jackson, Miss.—Bids are asked until Feb. 4 for installing a steam heating plant and an electric light plant for the Alcorn Agricultural and Mechanical College. J. G. Savage, Chrm. Bldg. Com.

Richmond, Va.—Sealed bids are asked until 5 p. m. Feb. 1 for buildings, machinery, apparatus, pipes, etc., for the rehabilitation and proper enlargements of the city gas works. W. P. Knowles, Supt.

Washburn, Wis.—This city desires to engage an engineer to prepare plans, specifications, etc., for the construction of a 40, 50 or 60-ft. concrete dam for lighting plant. M. M. Sweet, Mayor.

Coeymans, N. Y.—The West Shore Electric Co. has filed an application with the State Lighting Commission asking consent to furnish the towns of Coeymans

and New Baltimore with electricity for lighting purposes.

Fort Mackenzie, Wyo.—Sealed bids are asked until Feb. 9 for making service connections and installing fixtures, watt meters in buildings and transformers for electric lighting at the post. 2nd Lieut. R. H. Kelley, Q. M.

Columbus, O.—Bids will probably be asked in March for 11,000 K. W. steam turbine, 1 1,000 K. W. turbine type alternator, 2 300 h. p. water tube boilers, stokers for same, 300 2,000 c. p. arc lamps, etc. M. N. Reid, Supt. Dept. Lighting.

Orange, N. J.—Special.—This city awarded contracts for the erection of a new municipal lighting plant which is to furnish power for the street lights and public buildings. The contract for the electrical machinery was awarded the Crocker-Wheeler Company, of Ampere, N. J. The equipment will consist of 3 150 K. W. alternating current generators, 2,300 v., 200 r. p. m. This plant is situated within a few miles of the Crocker-Wheeler Company's main office and works at Ampere, N. J.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Stockton, Cal.—A garbage crematory is contemplated. R. C. Tumelty, Cy. Engr.

Scottdale, Pa.—Will issue bonds for erecting a garbage furnace. A. L. Porter, Clk. Boro. Coun.

Norfolk, Va.—The bd. of control decided Jan. 8 to petition council for an appropriation of $20,000 for improving and enlarging the crematory.

Adrian, Mich.—Bids are asked until March 1 for removing garbage from within the corporate limits of the city for 1 year from April 1. John Mawdsley, Cy. Clk.

Harrisburg, Pa.—J. Skeeskey is chairman of a special committee appointed by city council to secure information preliminary to erecting a garbage disposal plant. M. B. Cowden, Cy. Engr.

PARKS.

Winona, Minn.—The park board has received a donation of $75,000 for improvements to Lake Park and Buffside Park.

Newark, N. J.—The Essex Park Commission decided Jan. 22 to establish a public park in the "Ironbound" district.

Columbia, S. C.—The question of establishing a riverside park near the sedimentation basin is favorably considered.

Glen Ridge, N. J.—The citizens voted Jan. 22 in favor of issuing $15,000 bonds for the purchase of land adjoining the Glen Ridge schools for playgrounds.

Washington, D. C.—The district commissioners have approved the bill providing for the establishment of a public park at Fort Thayer, in the district. It is proposed to purchase 105,342 sq. ft. of ground for the park. A bill was introduced Jan. 22 appropriating $100,000 for the purchase of playground sites in close proximity to school buildings.

FIRE APPARATUS.

Pella, Ia.—Special.—A. C. Kuypen is in market for an electric fire alarm system.

Aberdeen, S. D.—Council voted to purchase additional apparatus for the fire department.

Winnebago, Minn.—The fire department wants 600 ft. more of hose and 3 chemical hand apparatus.

Milwaukee, Wis.—Council decided Jan. 21 to submit the question of issuing $100,000 bonds for the fire department to vote.

TOO LATE FOR CLASSIFICATION

Blue Hill, Neb.—Will vote soon on the issue of bonds for a lighting plant.

Haverhill, Mass.—The estimated cost of a pumping plant for the Third ward sewer is $23,000.

Jacksonville, Fla.—Vitrified brick paving is contemplated for 4th st. from Pearl to Main.

Marion, O.—A resolution was passed Jan. 21 for paving S. Prospect st. from Hill st. to the corporation line.

Rensselaer, Ind.—Bids are asked until Feb. 12 for constructing the Carpenter twp. system of macadamized roads. Co. Comis.

Cincinnati, O.—The plant of the Cincinnati Reduction Co., at Riverside, was burned Jan. 22, entailing a loss of $50,000 to $75,000.

Van Buren, Ark.—The contract for constructing sanitary sewer No. 1 was awarded to the Prather Construction Co. of this city Jan. 22, for $10,338.

Birmingham, Ala.—Ordinances have been passed providing for sale of bonds for the purpose of constructing bituminous and vitrified brick paving and sidewalks on a number of streets. Geo. B. Ward, Mayor.

Hattiesburg, Miss.—Mayor Donald and the city council favor a bond issue for resuming work on the paving of the residence streets.

Portage, Wis.—Plans for a new cement mfg. plant, to be built north of here by the Wisconsin Portland Cement Co., are being made by Prof. Dugald C. Jackson, of the University of Wisconsin.

Wichita, Kan.—Paving is proposed for Lawrence ave. Bids were received Jan. 21 for constructing a new storm water sewer, the lowest being $286,000. Another bid was for $290,000, but owing to the fact that the bids were so close the award of contract was deferred until more thorough consideration could be given them.

Pittsburg, Pa.—The stockholders of the Crescent Portland Cement Co. voted recently to increase the capitalization of the company from $150,000 to $1,000,000. The reason for the increase is to provide funds for the erection of a new mill in Big Beaver twp., Lawrence county. Officers were elected as follows: President, W. J. Prentice, Pittsburg; vice president, C. M. Hughes, Beaver; secretary and general manager, R. H. Hughes, New Castle; treasurer, G. W. Hackett, Pittsburg; assistant treasurer, Hon. J. S. Wilson, Beaver.

Titusville, Pa.—Bids are asked until Feb. 1 for paving streets. H. A. Holstein, Cy. Engr.

Princeton, Ind.—Bids are asked until Feb. 1 for constructing 11 miles of macadam and gravel roads. Harry R. Embree, Co. Audt.

Cincinnati, O.—Bids are asked until Feb. 15 for repairing State Road between corporation line of Cleves and a point 2 miles east of Miami twp. W. H. Blair, Prest. Bd. Co. Comrs.

Asbury Park, N. J.—Bids are asked until Feb. 2 for drilling an artesian well. John L. Coffin, Supt. Water and Sewers.